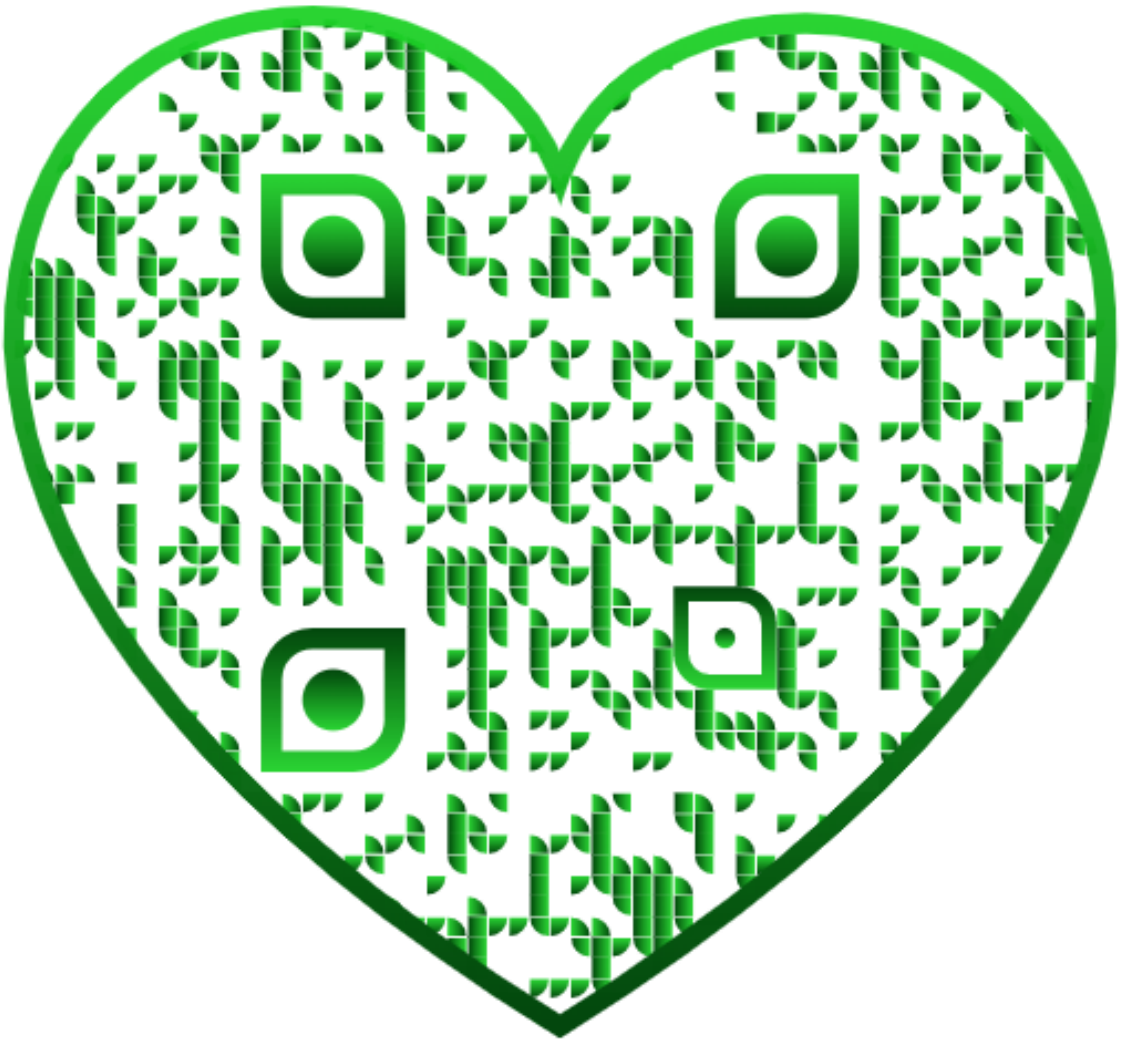
What Happens When We Die

A Groundbreaking Study into the Nature of Life and Death

Sam Parnia, M.D.



What Happens When We Die

A Groundbreaking Study into the Nature of Life and Death

Sam Parnia, M.D., Ph.D.

Hay House, Inc.
Carlsbad, California • New York City
London • Sydney • Johannesburg
Vancouver • Hong Kong

CONTENTS

Foreword by Dr. Peter Fenwick

Introduction to the Revised Edition

Chapter 1: Near-Death Experiences from Antiquity to the Present Day

Chapter 2: Setting Up the Southampton Study

Chapter 3: What Is It Like to Die?

Chapter 4: The Scientific Paradox

Chapter 5: Understanding the Mind, the Brain, and Consciousness.

Chapter 6: The Ingredients of Life

Chapter 7: Is It Real?

Chapter 8: The Horizon

Chapter 9: Implications for the Future

Acknowledgments

Further Information

Recommended Reading

Bibliography

About the Author

Ascent into the Empyrean—panel from an altarpiece thought to be of the Last Judg-ment (oil on panel), Bosch, Hieronymus (c.1450–1516)/Palazzo Ducale, Venice, Italy (Bridgeman Art Library)

FOREWORD

It requires a special kind of scientist to ask the question *What happens when we die?* One thing is certain, and that is that we shall all die. But in our culture, we tend to ignore the fact of our mortality, and it is usually only when a close friend or family member is dying that we uneasily acknowledge our own inevitable progression toward death.

This is a subject that for thousands of years has largely been a question for philosophical debate rather than objective scientific exploration, but in recent times science has started to advance our understanding of what happens when we die, both physiologically and in terms of the human mind.

The work of Dr. Raymond Moody and the publication of his book *Life After Life* in 1972 suggested that there was a set of phenomena that he termed "the near-death experience," which might provide some clues about what we experience at the end of life. However, the difficulty with this early data on near-death experiences (NDEs) was that although many people who had indeed been near death described them, the full potential of the NDE was not understood by scientists, who saw it as just another mental state that could easily be explained by our current scientific understanding of brain function.

It took the foresight, understanding, and sensitivity of Dr. Sam Parnia to see the full potential of the NDE and the contribution it could make to our understanding of death and dying. He also realized its significance with respect to the most crucial problem now faced by neuroscience—the nature of consciousness. His profound realization was that our best understanding of death and dying could be achieved by only studying those NDEs that occurred during cardiac arrest (when the heart stops, and after 11 seconds, consciousness and brain electrical activity cease) so that no areas of brain function remain that could support consciousness. Even the very basic life-supporting systems are destroyed; and respiration, cardiac output, and brain-stem life-support reflexes are all absent—a state equivalent to clinical death.

Dr. Parnia saw that this state, which remains reversible for about 30 minutes, is the closest model that science can have of the dying process and provides a unique window for understanding what we all experience at the end of life.

One of the most interesting features of the near-death experience during cardiac arrest is that upon recovery, patients sometimes report leaving their bodies and watching the resuscitation process. Although many researchers have argued against their validity, workers have now suggested that many of these accounts accurately describe what actually happened. This anecdotal evidence suggests that during the time that brain function was absent, the patient not only had experiences, but was also able to remember them, even in the absence of brain processes. This is a startling possibility. Dr. Parnia single-handedly attempted to examine these claims in a preliminary study by hiding targets on the ceiling of the coronary-care unit in hospital wards in Southampton to see whether they would be reported in out-of-body claims. This in itself tells us a great deal about him—not many doctors would have been courageous or determined enough to persuade their cautious and conservative medical colleagues to agree to this, and only a scientist who had a true vision for his scientific research would have attempted it.

For science, the important question is, does the near-death experience occur and consciousness indeed continue when all brain functions are absent —something our current neuroscience regards as impossible—or does the near-death experience occur either before or after the cardiac arrest, although it is interpreted by the experiencer as occurring during unconsciousness?

The recent findings are both startling and intriguing and may hold the key to discovering not just what happens when we die, but also the wider question of the nature of the self.

More studies like Dr. Parnia’s would tell us so much more about the nature of consciousness, and indeed what happens when we die, that to my mind science and scientific funding bodies should now make strenuous efforts to shine the laser beam of science onto this intriguing area so as to either validate or refute the possibility of continuity of consciousness beyond the brain and at the end of life.

My hope is that after reading this story, wonderfully told by Dr. Parnia, not only will more people develop an understanding of what happens when we die, but that more scientists, philanthropists and forward-looking scientific bodies will agree to conduct and support the next stage of this research and so

help to push forward one of the final frontiers of neuroscience.

—**Dr. Peter Fenwick,** BA, MB, BChir, DPM, FRCPsych
Consultant neuropsychiatrist and neurophysiologist,
Institute of Psychiatry, London

❑❑❑❑❑❑

INTRODUCTION TO THE REVISED EDITION

It has now been two years since the completion of the first edition of this book, and I am pleased to say that during that time there has been continued progress toward understanding what happens when we die. This is one of the main reasons why I have updated this book, and I hope that it will continue to provide you with a thoroughly up-to-date understanding of the subject while still maintaining a balance between scientific correctness and readability.

In order to keep the book light and simple to read, as well as putting the issues into an appropriate context, I have mixed current scientific knowledge of the subject with many personal experiences and anecdotes, as well as my own motivation and reasons for conducting research. I have also purposefully kept the scientific discussions brief but relevant for the wider discussions, while providing many references that will allow interested readers to study specific areas in more depth.

In the 12 years since I started my research, I have discovered that there is widespread public interest in what happens when we die. The feedback that I received from readers following the publication of the first edition of this book ranged from “sheer enjoyment” to “disappointment.” While I’m delighted and truly honored to hear that some people enjoyed reading it, I would like to take this opportunity to address some of the points raised by those who expressed dissatisfaction.

Many people were specifically disappointed by the subtitle: “A Groundbreaking Study into the Nature of Life and Death,” which led them to expect specific results. As pointed out, however, this is a new and novel area of study, and the nature of science itself is such that it takes time—often a very long time. It is nonetheless the objective method of study of choice, and one whose results are consequently the most reliable. Therefore, the subtitle,

and in particular the word *study*, refers to the subject as a whole rather than to one all-encompassing scientific study carried out by the author.

The specific objectives of this book are in fact: (a) to make people aware that a whole new area of "scientific" (rather than philosophical) study has started, a field of research that could potentially answer one of the oldest questions facing humankind—that is, what happens when we die; (b) to provide the background that has led to this new research; and (c) to outline the results and rationale of the studies carried out by independent researchers that have raised the possibility that the human mind and consciousness may continue to function when the brain shuts down and we go through clinical death. From a scientific standpoint, these are all very significant events, and the potential knowledge that will be coming out of this field of work is immense.

Under usual circumstances, when enough scientific data is obtained to raise the possibility of a profound scientific breakthrough, it is shared with others. For example, as soon as the possibility of a cure for genetic diseases was raised by the potential of gene therapy, hundreds of books were written on the subject. At least two decades have now passed since the original discoveries, and very few conditions have been amenable to such treatment to date, yet gene therapy still remains one of the most potentially rewarding areas of medical research, and people with an interest in it should be aware of the latest information. It is the same with the scientific study of clinical death. This is an area that is brand new to the scientific arena and so, in my opinion, people should have access to the latest findings without having to wait until all the discoveries have been made.

I would also like to explain at the outset that although my colleagues and I are in fact currently involved in potentially groundbreaking scientific research into the state of the human mind, brain, and consciousness during death, the results of these studies are still potentially a few years away, and at this point we simply do not know what they will show. On the one hand, they may prove the observation that mind or consciousness continues to function during clinical death, they may demonstrate the complete opposite, or they may be inconclusive. This is the reality of scientific study. I can, however, say that we are perhaps only a few years away from making these discoveries, and this in itself is extremely exciting! We have numerous very promising scientific projects planned and, most important, the first of these is

now under way. So, at this point we just have to wait for the results to come through, and I do hope to be able to include these in subsequent editions of this book as they become available.

One of my other aims in writing this book has been to convey to readers that science is not easy and that research takes a very long time and is invariably riddled with real difficulties. This is true for research in any field, but even more so for an area that is completely new. We, too, have had obstacles to face and undoubtedly will have more in the coming months and years, particularly since there are some who feel that science should not study the outcome of the human mind and consciousness during death. As with any new area of study, one of the greatest difficulties lies in breaking down old taboos and prejudices and showing that there are alternatives. I have purposefully not omitted our own problems from this book so that you can truly appreciate the ups and downs associated with this type of work. Success and failure are twins, and one cannot get one without the other. For every successful moment there are many moments of failure. The key is to persevere.

Finally, I would like to point out that this is not solely a book on the subject of near-death experiences (NDEs). My area of interest is in fact the objective study of the human mind, brain, and consciousness during clinical or "actual" death. Since the roots of this study lie in the discovery of NDEs, there are invariably many references to such experiences in this book. Nevertheless, it aims to move beyond this subject and into studies of "actual death experiences" (ADEs), which is a more correct term for what we are currently researching.

—Sam Parnia

❑❑❑❑❑❑

CHAPTER ONE

NEAR-DEATH EXPERIENCES FROM ANTIQUITY TO THE PRESENT DAY

I was a very curious child and used to spend hours trying to "make" things that "worked." To my great disappointment, they usually didn't work at all, but this didn't stop me from trying! Like most children, I spent most of my time exploring the world around me and asking lots of questions—sometimes too many for my parents' liking!

Nevertheless, my mom and dad encouraged the pursuit of learning. They also attached great importance to ethical behavior, although they weren't particularly interested in religion. I remember that my father often used to deny the existence of God. He used to tell me that there was too much injustice in the world to account for God. My mother sometimes believed in God, and sometimes she wasn't sure. At school I was taught basic religious education, and sometimes I'd go back home and tell my father what I'd been taught and he would just brush it off as nonsense!

When I was about 15 or 16 years old, I watched a very interesting television documentary on near-death experiences, or NDEs, as they're now called. This was the first time I'd heard of people describing a sense of separating from their body when close to death. At that time I also came across a book describing people's experiences when close to death. What was most striking was the similarity of all the experiences—seeing a bright light, a tunnel, and a heavenly place—and the many cases of people in a coma who'd described being able to watch what had happened to them from above. I was fascinated by the claims that dying or unconscious people had

accurately described what had happened to them and that their doctors had confirmed what they'd said. Many people also seemed to believe that this indicated an afterlife. Although I was somewhat skeptical, the accounts were very interesting nevertheless.

As I grew older, my childhood curiosity gradually became more focused on the human body and how it functioned. I remember the day I understood how cells produced proteins. It was a miracle to me how these tiny little cells accurately assembled and manufactured all the proteins that made up our body. *How wonderful the human body is!* I thought. It was this curiosity and interest in the human body, together with a sense of caring, that led me to study medicine.

In October 1990, I entered medical school. Like many other students, I was initially shocked into a state of submission by the sheer volume of work that was needed to pass my exams, and like many others, in the first term I failed some and passed some until I finally found my footing, started working hard, and consistently and eventually passed my first two years. During this time, as well as living in a state of constant worry, my friends and I also had lots of fun. Our course entailed performing many experiments on one another, such as putting tubes down one another's stomachs, pouring alcohol in and watching what happened as the stomach acid levels rose. We also took blood from each other. I'll never forget my friend Ali's face when he saw me approaching his arm with a needle! He pressed himself back into the seat, turned as white as a sheet and begged, "Please be careful—there might be a nerve behind the vein!"

One day in the lab, as I was looking down a microscope at a collection of single cells and noting their structure, my thoughts drifted to another problem: *How? How can these brain cells actually give rise to thoughts?* They were cells just like any others—why should they produce thoughts? *How do our thoughts arise?*

As time went on, the area that I became most interested in was the brain, specifically the relationship between the mind and the brain. I was fascinated by what it was that made every one of us unique. At that time, I believed very strongly that the answer to this question lay somewhere in the brain. I worked very hard during my neuroscience modules and almost took time off for a separate degree in neuroscience, except that I soon realized, to my disappointment, that this would probably not help me in my quest. The

problem was that science didn't yet have the answer to my questions.

The next three years of my life were spent training in clinical medicine. Here I started to deal with actual patients and to face real life-and-death questions. During this time I observed how little we knew about the dying process and how human awareness came to exist. In my final year, meeting Desmond and watching him pass away really brought all these experiences together and raised many questions in my mind. However, upon my return to England, I had to focus almost solely on passing my final examinations in medicine and had no time to think of anything else.

One morning, with a few weeks left until my final exams, I was going through the monotony of studying when my mother, who knew of my interest in NDEs, called out, "Come and watch this on TV!" Looking for an excuse to stop studying, I decided to take a quick break.

It was a program on near-death experiences. There were numerous experts talking about the subject, many of whom were presenting their own theories almost as "facts," though they were not yet proven. I was very disappointed by this and thought that it wasn't scientific. There was one expert, however, who drew my attention. He was Dr. Peter Fenwick, a neuropsychiatrist and neurophysiologist based at King's College Hospital in London, who was widely recognized as an international authority on the mind and brain. He gave a very honest summary of the different NDE theories and conceded, "We still do not know why neardeath experiences occur." I liked his modesty and honesty, and thought, *If we don't yet know, then how are we going to find out? There must be a way to study this through science.*

A few weeks later I discussed my interest in near-death experiences with my university tutor, a professor of psychiatry, who confessed that he knew very little about the subject and suggested that the best person to speak to was a fellow psychiatrist, Dr. Peter Fenwick! I knew I had to try and arrange to see him—I just had to pass my exams first!

After years of studying, worrying, and thinking it would never happen, finally I qualified as a doctor in the summer of 1995. I was truly ecstatic. A good friend of mine said I spent the whole summer "almost on the clouds"!

After a break and a vacation in France, I came back to England feeling much more relaxed and ready to focus on the questions that had been on my mind ever since I had met Desmond in New York. I decided that the best way to find the answers was to do the work myself. That way I would be sure of

it, and then I could also make the results available to others.

My first port of call was Dr. Fenwick. I called up his secretary, Maureen, but she said, “It’s impossible to meet with him in the next few months, as he’s going on a lecture tour to the Far East and is fully committed until his return. I can book you to see him in two months’ time, if that’s okay.”

“Two months?” I asked, disappointed.

She must have felt sorry for me then, as she added, “Well, come by tomorrow at lunchtime, and maybe he’ll see you between appointments—but I can’t promise anything.”

At that time, Dr. Fenwick had just published a book on NDEs, *The Truth in the Light*, which was a critical examination of more than 300 cases selected from approximately 3,000 that had been sent to him. I was quite nervous about meeting this highly respected doctor and wanted to make a good impression, so I went out and bought the book.

King’s College Hospital was in a rundown area of London, and Dr. Fenwick’s office was at the end of an old Victorian corridor. I turned up at lunchtime and waited outside the office. Finally, a tall, slim man with gray hair appeared and walked toward me. As he approached, I stood up and nervously clutched his book to my chest, pushing it up a notch so that he’d notice it and perhaps stop and talk to me. But instead he looked at me in a rather bemused fashion and walked straight past me to his secretary. Fortunately, she had a word with him, and then he came back and was very welcoming and warm. My nervousness quickly disappeared as I relaxed and explained why I was there.

“I’m sorry I don’t have much time today,” he said, “as I have a clinic until 9 p.m. tonight. Can you come back tomorrow? I have an hour free then.”

This was the beginning of a friendship that developed over the next 18 months. During this time I came to know both Peter and his wife, Elizabeth, and really enjoyed their company. They were very kind and gracious people with a real zest for life. We met a number of times and discussed near-death experiences and the various research possibilities.

Our paths were very different. He was an eminent neuro–psychiatrist who’d almost reached the end of his career, while I was starting my first job as a doctor. In the next few months, he went to Malaysia and gave lectures, while I went to Medway and learned how to put in venous catheters while trying to stay awake after sleepless nights!

One evening I went to the small hospital library and searched “near-death experiences” on the medical database. I only got 55 or so results back—not very encouraging for a subject that had received so much media attention over the last 20 years. Any other subject and I would have found hundreds or even thousands of entries per year.

With the help of the British Library, I began to search through the medical literature to find out what research had already been done on NDEs. I soon realized that in order to study the phenomenon objectively, it was important to examine a number of key questions:

1. Were these experiences a modern phenomenon, or had they been a part of the dying process since ancient times?
2. How common were the experiences, and were they associated with a particular personality type, culture, or age?
3. How could we classify NDEs, as opposed to other mental states and experiences?
4. How could the occurrence of NDEs be explained scientifically?

Examining the medical literature, it became clear to me that these questions were in fact those that had occupied researchers in the 1970s and 1980s, and some of the answers were already available.

The First Scientific Studies

It wasn’t really until as late as the mid-1970s that the study of the human mind during the dying process began to enter the realm of science. Before then it had been considered a matter for religion and philosophy only. The scientific community’s interest had started when Ray Moody, an American doctor and former university lecturer in philosophy, published his best-selling book *Life After Life* in 1975. In that work, Moody had collected the accounts given by 150 survivors of near-death encounters. Remarkably, he found that they’d all described similar experiences. These included feeling at peace, separating from their body, seeing a bright light, seeing a tunnel, seeing deceased relatives, entering a heavenly domain, and having a life review. At the time, these people had been unconscious. The experiences had often had a

positive effect on their lives, leaving them more pious, religious, and less afraid of death. Moody had termed these events “near-death experiences.”

At the beginning of the book, Moody had provided an “ideal” or “complete” near-death experience based upon all the common NDE features. He emphasized that this wasn’t a particular person’s experience, but rather a model or composite of the features commonly found in NDE accounts:

A man is dying and, as he reaches the point of greatest physical distress, he hears himself pronounced dead by his doctor. He begins to hear an uncomfortable noise, a loud ringing or buzzing, and at the same time feels himself moving very rapidly through a long, dark tunnel. After this, he suddenly finds himself outside of his own physical body, but still in the immediate physical environment, and he sees his own body from a distance, as though he is a spectator. He watches the resuscitation attempt from his unusual vantage point and is in a state of emotional upheaval. After a while, he collects himself and becomes more accustomed to his odd condition. He notices that he still has a “body,” but one of a very different nature and with very different powers from the physical body he has left behind. Soon other things begin to happen. Others come to meet and to help him. He glimpses the spirits of relatives and friends who have already died, and a loving warm spirit of a kind he has never encountered before—a being of light—appears before him. This being asks him a question, non-verbally, to make him evaluate his life and helps him by showing him a panoramic, instantaneous playback of the major events of his life. At some point he finds himself approaching some sort of barrier or border, apparently representing the limit between earthly life and the next life. Yet he finds that he must go back to the earth, that the time for his death has not yet come. At this point he resists, for by now he is taken up with his experiences in the afterlife and does not want to return. He is overwhelmed by intense feelings of joy, love, and peace. Despite his attitude, though, he somehow reunites with his physical body and lives.

Later he tries to tell others, but he has trouble doing so. In the first place, he can find no human words adequate to describe these unearthly episodes. He also finds that others scoff, so he stops telling other people. Still, the experience affects his life profoundly, especially his views about death and its relationship to life.

[From *Life After Life* by Raymond Moody, published by Rider. Reprinted

with permission of The Random House Group Ltd.]

Moody went on to observe that most of the people who'd had an NDE didn't experience so many of the above features. They may have only recalled a limited number of them, maybe five or six. Also, the sequence in which the features took place varied—somebody may have had an out-of-body experience at the beginning of their NDE, for example, while another person may have seen a light at the beginning and have had an out-of-body experience at the end.

After the publication of *Life After Life,* NDEs became the subject of controversy and debate. While many people claimed that these experiences provided a glimpse of the afterlife, others, in particular within the scientific community, were more cautious, claiming that they were at best, hallucinations, and at worst, fabrications.

The years that followed saw a rise in the number of reports of out-of-body and near-death experiences. Some claimed that this was due to the recent publicity and that some of the accounts had been fabricated by attention-seekers. When researchers began to study these accounts in more detail, however, they found very little evidence to support this view, as many of the accounts pre-dated the 1970s. In fact, some of the accounts went back decades, even centuries. Also, in the vast majority of cases, the people involved consistently declined any publicity and were only prepared to share their experiences with researchers. Often they hadn't even mentioned them to their close family and friends.

Interestingly, in the 1980s, reports had also started coming in of those who'd experienced negative NDEs. These people often described frightful vacuums, demons, zombie-like creatures, torture, and other unpleasant experiences. It wasn't at all clear, though, whether these had really taken place when the people had been close to death or whether they'd simply been due to the symptoms of a severe illness, such as excess carbon dioxide in the blood, which I knew could sometimes give rise to such frightening incidents.

Historical NDEs

In the months that passed, as I examined the medical literature further, I found that there had been many accounts of near-death experiences in

different cultures and times. In fact, the oldest reference to an NDE occurs in Plato's *Republic*, written in the 4th century b.C. Here, an ordinary soldier, Er, suffers a near-fatal injury on the battlefield, is revived in the funeral parlor, and describes a journey from darkness to light accompanied by guides, a moment of judgment, feelings of peace and joy, and visions of extraordinary beauty and happiness.

Although the case from Plato could have simply represented the philosophical and religious views of the afterlife prevalent at the time, I also came across a very interesting work by Hieronymus Bosch, the famous 15th-century Dutch painter. In a painting entitled *Ascent into the Empyrean*, he had depicted what looked like a typical NDE: a passage down a tunnel toward a bright light, with people being taken there by angels (see Frontispiece). I wondered whether Bosch had experienced an NDE himself or whether someone else had described one to him.

Then I came across another very interesting historical case. An admiral with the British navy had narrowly escaped drowning in Portsmouth harbor in 1795. Following his ordeal, he had described his experience in a local newspaper:

> Though the senses were … deadened, not so the mind; its activity seemed to be invigorated in a ratio which defies all description, for thought rose above thought in rapid succession. The event just occurred … the awkwardness producing it … the bustle it must have occasioned … the effect on my most affectionate father … the moment in which it would be disclosed to the family, and a thousand other circumstances minutely associated with home were the first reflections. Then they took a wider range, our last cruise … a former voyage and shipwreck, my school and boyish pursuits and adventures. Thus traveling backwards, every past incident of my life seemed to glance across my recollection in retrograde succession; not however in mere outline, as here stated, but the picture filled up with every minute and collateral feature. In short, the whole period of my existence seemed to be placed before me in a kind of panoramic review, and each part of it seemed to be accompanied by a consciousness of right or wrong, or by some reflection on its cause or consequences; indeed many trifling events which had been forgotten then crowded into my imagination, and with the character of recent familiarity.

These two historical cases fascinated me. They were only anecdotes, but obviously demonstrated that NDEs were definitely not just a modern phenomenon.

I then came across the first systematic and scientific study of NDEs. Albert Heim, a 19th-century Swiss geologist and mountaineer, had survived a near-fatal mountaineering accident and had gone on to collect 30 firsthand accounts from other survivors of near-fatal mountaineering accidents. He

found that they'd all had similar experiences. His own was typical: "… no grief was felt nor was there any paralysing fright. There was no anxiety, no trace of despair or pain, but rather calm seriousness, profound acceptance and a dominant mental quickness. The relationship of events and their probable outcomes were viewed with objective clarity, no confusion entered at all. Time became greatly expanded."

Heim found that in many cases there then followed a sudden review of the person's entire past, and finally they often heard "beautiful music" and fell into what they visualized as "a superbly blue heaven containing roseate cloudlets." Heim's work was published in 1892.

How Common Were NDEs?

Looking through the literature, it became obvious that in the late 1970s and throughout the 1980s, research had predominantly centered on characterizing the different features of the NDE. In addition, researchers had wanted to find out more about the nature of the experience and how often it occurred.

The best account of the prevalence of NDEs had come from a Gallup survey carried out in the U.S. in 1982. This survey had concluded that near-death experiences had occurred in approximately eight million people, or 4 percent of the population. As I read this, I thought it was an astonishingly high proportion, much higher than I would have imagined. Unfortunately, there hadn't been any more studies to confirm these findings, and there was no data regarding the overall prevalence of the phenomenon in other countries.

Although it was obvious that further work was needed to fully understand how prevalent the near-death experience was in society on the whole, this survey indicated that it was probably *quite* common and certainly *far more* common than most people had thought.

Did Religion and Culture Affect NDEs?

Some studies had been carried out with the aim of studying the NDE phenomenon in non-Western cultures. Obviously, understanding the role of

culture was vital. If all the experiences reflected people's preconceived ideas, this would support the notion that NDEs were based upon individuals' own backgrounds rather than a universal phenomenon that transcended cultural and religious views.

Historically, I found that events closely resembling NDEs had been described by Bolivian, Argentinean, and North American Indians; and had appeared in Buddhist texts, Islamic works; and in accounts from China, Siberia, and Finland. The most common features were: (a) having an out-of-body experience; (b) a reunion with ancestors and departed friends; (c) an experience of light accompanied by joy and peace; and (d) a border or dividing line between the living and the dead.

In more modern times, near-death experiences had been described in many areas of the world, including India, China, South America, and the Middle East. Interestingly, in these countries relatively little if any publicity had been given to the phenomenon.

In the cases recalled by people in non-Western cultures, it had been found that although the central features were universally present, the interpretation of the experience may have reflected personal religious or cultural views. In other words, during a close encounter with death, people from different parts of the world may have all felt peaceful; seen a tunnel, a bright light, and a being of light; and had the sensation of detaching from their bodies, but they may have identified the being of light according to their own cultural and religious backgrounds. In one study, for example, carried out in 1985, the experiences of 16 Asian Indians had been compared with those of Americans, and it had been found that the Indians had often encountered Yamraj, the Hindu king of the dead, while the Americans had not.

The largest cross-cultural study had been carried out in 1977 by Osis and Haraldsson and had focused more on deathbed visions. These are the experiences that people have before death, usually in the 24 hours prior to dying, and they're different from the classic near-death experiences. Deathbed visions are usually reported by caregivers who've looked after a person during the dying process. In this study, the researchers had examined the visions of approximately 440 terminally ill American and Indian patients as described to their doctors and nurses. The most common feature, which occurred in 91 percent of cases, was seeing deceased relatives. In 140 cases, there were reports of seeing religious figures, usually described as an angel or

God. Where these were specifically identified, they were always described according to the person's religious beliefs: no Hindu reported seeing Jesus, and no Christian a Hindu deity.

I soon came to realize that the central features of the NDE had been recorded throughout history and across numerous cultures and religious groups. The experience had also been described by atheists as well as those with a particular faith, whether practicing or nonpracticing. But what about personality?

Did Personality Affect NDEs?

In the 1980s, several researchers had investigated whether there was a relationship between a particular type of personality and having an NDE. In other words, they wanted to find out whether certain people had a predisposition to having the experience.

In one study, a comparison was made between people who'd had an NDE and people who had not, as regards IQ levels, an extroverted personality, a neurotic personality, and anxiety. No significant differences were found. In another study, researchers found no difference in measures of hysterical tendencies, death anxiety, danger-seeking, and a psychotic personality.

Other studies had suggested that there might be an increased likelihood of prior mystical experiences in those who had NDEs. This was interesting, although I wondered whether there was possibly a limitation associated with these studies in that they'd involved somewhat biased samples of people. Essentially, the people used in the studies had volunteered their experiences. As such, they may have represented a specific group of people who were more likely to have had prior mystical experiences and therefore more apt to volunteer them to investigators. It wasn't clear whether the reason for the difference wasn't simply that people without prior mystical experiences were less inclined to come forward.

Did NDEs Also Occur in Children?

Without a doubt, the most interesting group of individuals to have reported

NDEs were children. Some investigators and commentators had argued that adults might have imagined NDEs based upon their own personal cultural and religious views, but the children in the studies were often too young to have formed an opinion regarding the afterlife, or even death itself. I was curious to know if their experiences were the same as those of adults, or different in some way.

The most research on NDE in children had been done by Dr. Melvin Morse, an American pediatrician. He had looked at many critically ill children admitted to the intensive care unit (ICU) and had found that some had, in fact, described NDEs. These experiences had many of the same features as those of adults—separating from the body, watching events, feeling peaceful, seeing a bright light, and beings of light—but had often been described in children's terminology and during the course of play, sometimes over many months. The children's interpretation of what they'd seen had been based upon their own level of comprehension, but it was nevertheless clear that they'd had experiences similar to those of adults. Significantly, although some of the children described by Morse had been around nine or ten years old, others had been very young, just three to five. This group was certainly too young to have had any real concept of death and the afterlife, so it was fascinating that they'd had experiences similar to that of adults.

In one of his published scientific articles, Morse had presented a number of the children's NDEs. For example, an eight-year-old boy who'd almost drowned after his parents' car had swerved off an icy road into a river in Washington had reported: "I could see the car filling up with water, and it covered me all up. Then everything went blank. Suddenly I was floating in the air. I felt like I could swim in the air." He was very surprised to still be thinking, as he knew he must have died. He continued, "Then I floated into the huge noodle. Well, I thought it was a noodle, but maybe it was a tunnel. Yeah, it must have been a tunnel because a noodle doesn't have a rainbow in it."

A five-year-old girl whose heart had stopped had reported: "I rose up in the air and saw a man like Jesus, because he was nice and he was talking to me. I saw dead people, grandmas and grandpas, and babies waiting to be born. I saw a light like a rainbow, which told me who I was and where I should go. Jesus told me it wasn't my time to die."

The youngest case was that of a six-month-old baby who'd been admitted to the intensive care unit of Massachusetts General Hospital with severe kidney failure. He had survived and had been discharged to go home with his parents. As he was growing up, his parents noticed that whenever he went through a tunnel he'd have a panic attack. This happened even if he was playing with his siblings and went through a playground tunnel. Eventually, when he was four, his parents had attempted to explain the imminent death of his grandfather, and he'd said that he had died, too, and had related his experience in the ICU. I really wanted to know more about this experience, but the researchers hadn't reported it in detail.

I was intrigued by these experiences in kids and really wanted to interview a child myself. Later I had the good fortune to be contacted by someone whose grandchild had had an NDE, but in the meantime I carried on, trying to answer some of my own fundamental questions through the study of medical literature. One of my questions was how we could classify NDEs as opposed to other mental states and experiences.

Research Scales Used to Classify NDEs

By looking at the features described by Moody and other investigators it was obvious that many of the characteristics of an NDE were by no means specific to those who'd come close to death. In fact, there were many examples of people who were perfectly well or physically ill but not close to death who had feelings of joy and peace and/or saw a bright light. In order for the experience to be classified as an NDE, there needed to be a series of common features and not just one or two.

In the same way that we couldn't claim that anyone who felt intensely peaceful, for example, had experienced an NDE, neither could we claim that anyone who'd experienced seeing a light had also had an NDE. So how might we differentiate between an NDE and other experiences? Obviously a research scale was needed. I found two that had been devised in the 1980s by two different American researchers.

The Weighted Core Experience Index

In order to allow researchers to differentiate between near-death and other experiences, in 1980 Kenneth Ring, an American psychologist, devised a ten-point interview scale that allowed the experiences to be standardized and measured. He named his research scale the "Weighted Core Experience Index."

Ring then went on to analyze the experiences of 102 people who'd come close to death. He found that based upon this weighted scale, 48 percent of his group had experienced an NDE.

Having examined the cases, Ring concluded that there was a "core experience" that unfolded in a characteristic pattern. The stages that he described were:

1. An experience of peace, well-being, and an absence of pain
2. A sense of detachment from the physical body, progressing to an out-of-body experience
3. Entering darkness, a tunnel experience with panoramic memory, and a predominantly positive effect
4. An experience of a light that is bright, warm, and attractive
5. Entering the light; meeting persons or figures

THE GREYSON SCALE

In 1983, Bruce Greyson, a psychiatrist who's currently a professor at the University of Virginia, criticized the Ring scale as being based upon ten arbitrary points and devised another measurement scale, which he based upon interviews with 74 people who'd had NDEs. He then collected the 16 most frequently encountered features, as recalled by his sample of 74 people, and developed a 16-point questionnaire, which he termed "the Greyson scale" (see the table below).

1. Experiencing an altered state of time
2. Experiencing accelerated thought processes
3. Life review
4. Sense of sudden understanding

5. Feelings of peace
6. Feelings of joy
7. Feelings of cosmic oneness
8. Seeing/feeling surrounded by light
9. Having vivid sensations
10. Extrasensory perception
11. Experiencing visions
12. Experiencing a sense of being out of the physical body
13. Experiencing a sense of an “otherworldly” environment
14. Experiencing a sense of a mystical entity
15. Experiencing a sense of deceased/religious figures
16. Experiencing a sense of a border, or a point of no return

The Greyson Scale gives each of the 16 features a score of 0, 1, or 2. The score depends first on whether the feature has been experienced, and second on how intense the experience has been. Therefore, using this scale, anyone’s experience can be graded and given a score. There’s a potential maximum score of 32, but for an experience to be defined as an NDE, Greyson stated that a minimum score of 7 was needed.

Since the early 1980s, research studies have used one of these two scales to standardize and compare the NDE experiences recounted by people. Although both research scales have some limitations in their day-to-day applications, they’ve been particularly useful during research because they’ve provided a basic means of defining an NDE and semi-quantifying the depth of the experience. For example, one person may have a score of 8 on the Greyson Scale, whereas somebody else may have a score of 16. The person with the higher score is very likely to have experienced eight to ten features of an NDE, whereas the other person has probably experienced four to six.

Potential Future Work to Improve NDE Scales

While studying the research scales devised by Drs. Ring and Greyson, I began to think that they had certain limitations, and future research should

focus on developing other research scales.

Both scales currently in use were either based or tested upon subjective NDE accounts given by people many years after the event. From a scientific point of view, researchers were thus limited by the fact that they couldn't ascertain objectively how close to death an individual had really been. This was because in the majority of cases, researchers didn't have access to the medical records from the time of the experience and so were necessarily limited to what the patient described about their condition. In some cases, this may have been sufficient to ascertain that the patient's life was in danger, as they may have been told by medical staff that they'd suffered a cardiac arrest or other critical condition, but this wasn't universal. Therefore, an improved standard scale would be one based upon recalled experiences from patients who had been proven to have been medically close to death. Experiences recalled from such a period could then truly be called "near-death" or even actual "dying" experiences.

Scientific Arguments for the Causation of NDEs

Although at first some scientists had been skeptical about whether NDEs even occurred, in modern times most researchers had come to accept that they did take place, and the main area of debate had focused around their possible cause and significance. I found that three broad views had been proposed to account for the causation of NDEs.

Brain-Based Theories: Hallucinations

The most widely accepted scientific arguments had largely centered around the concept that the experience was a hallucination in response to changes in the brain at the time of death. It had been argued that although NDEs might seem real to those who had experienced them, there were nevertheless physiological and chemical derangements accompanying the process of death that might as a consequence also cause hallucinations. These chemical changes were thought to cause the near-death experience. It was also well known that hallucinations often seemed very real to the person experiencing them but didn't correspond to objective reality.

To support this argument, many brain mediators had been proposed to account for the experiences, although none had yet been shown to be responsible experimentally. These included a lack of brain oxygen, increased carbon dioxide, the release of endorphins (the body's own morphine-like substance), a specific type of seizure known as temporal lobe epilepsy, various drugs, and in particular, drugs that were known to cause hallucinations, such as ketamine (which is occasionally used as an anesthetic).

1. The "Dying Brain" Hypothesis

—*The role of oxygen:* The basic brain-based theory as proposed by Dr. Blackmore, a well-known psychologist and NDE researcher from Bristol, has become known as the "dying brain" hypothesis. This theory proposed that different events such as severe stress, extreme fear, and a lack of brain oxygen, which can all occur during the dying process, may cause uncontrolled activity in the brain areas responsible for vision and thus lead to the illusion of seeing a light and a tunnel.

This was quite an elegant theory and was based on how the cells in the brain worked. In daily life, the vast majority of our vision comes from the middle part of our field of vision, with relatively very little coming from the outer fields or peripheral fields (central vision versus peripheral vision). This is why we have to use our central vision for all activities that require concentration, such as reading. The brain and the eye therefore have many cells devoted to analyzing information from the central portion of vision and relatively few cells devoted to analyzing information from the peripheral portion of vision.

Dr. Blackmore suggested that lack of oxygen to the brain may activate cells in the back of the brain, and as there are more cells involved in central vision, this may in turn create the illusion of seeing a bright light in the middle. As there are also fewer cells involved in peripheral vision, there may be relatively less activation of those cells, creating the impression of a bright light in the center that fades out toward the periphery, or in other words, a tunnel effect.

Support for this theory came from reports by certain highspeed fighter pilots. Due to the tremendous speeds reached by Air Force jets, any sudden

change in direction places an incredibly high pressure (G force) on the body of the pilot, which can lead to a sudden reduction in the flow of blood to the brain. This could cause a pilot to lose consciousness in mid-flight, with potentially fatal consequences. When experiencing this "G-LOC" phenomenon, some pilots had reported dreamlike states, as well as feelings of detachment and euphoria. Since these experiences had some similarities to some of the features of NDE and occurred as a consequence of a lack of oxygen to the brain, some scientists had argued that perhaps NDEs also occurred as a consequence of a lack of oxygen to the brain.

The G-LOC was an interesting phenomenon because when someone is dying, it's typical for there to be a reduced flow of blood to the brain. This is what the high-speed jets were inducing artificially in the pilots, so maybe the body really thought it was about to die. This could potentially account for the similarities with NDEs, although there hadn't been any reports of an actual NDE during G-LOC.

Although I thought that this lack-of-oxygen theory was very well thought out, I could see a number of areas where it didn't fit with the observations regarding NDEs and with medical practice. First, many people had reported having an NDE just before a moment of life-threatening danger—for example, just before the impact of a car accident. These people couldn't have had lowerthan-normal oxygen levels, as they had been physically untouched at the moment when they'd had the NDE. Furthermore, others had reported having an NDE even when they hadn't been critically ill and so would have had normal oxygen levels.

From a medical point of view, lack of oxygen is a very common problem in a hospital. Most doctors working with emergencies come across it regularly, particularly in patients whose lungs or hearts aren't working very well—for example, in cases of severe asthma or heart failure. I had looked after probably more than 100 patients with a lack of oxygen. When oxygen levels fall, patients become agitated and acutely confused. This "acute confusional state," as it is known medically, is very different from the near-death experience. During it, people develop "clouding of consciousness" together with highly confused thought processes with little or no memory recall. Unlike NDEs, which are typically universal well-structured thought processes with reasoning and memory formation, such experiences are fragmented and not universal. Also, those who have NDEs have an excellent

memory of the experience, which often stays with them for decades. This is the complete opposite of an acute confusional state.

If the dying brain theory were correct, then I would expect that as the oxygen levels in patients' blood dropped, they would gradually develop the illusion of seeing a tunnel and/or a light. In practice, patients with low oxygen levels don't report seeing a light, a tunnel, or any of the typical features of an NDE; and, in fact, this experience has never been reported by any other doctor or scientific study as a feature of lack of oxygen.

Interestingly, although Dr. Blackmore's theory suggested a mechanism to get a bright central light that faded at the periphery, thus giving rise to the illusion of a tunnel, in reality those who described the tunnel and light never described them in that fashion. Typically they were described as a bright light that was not fading at the periphery, with a distinct tunnel that was sometimes seen as other shapes such as kaleidoscopes, and so on.

—*The role of carbon dioxide:* When people stop breathing adequately, as the oxygen levels go down, there's also an increase in the carbon dioxide levels in the body. This is simply because there is reduced ventilation as the lungs stop working. Some scientists had proposed that NDEs might be taking place as a response to increased carbon dioxide.

In support of this, some had proposed the work of an American psychiatrist, L. J. Meduna, who had treated some people with carbon dioxide in the 1950s. Some of his patients had then experienced dreamlike states that had seemed very real to them.

Although this was very interesting to me, I knew that although raised carbon dioxide was an extremely common problem in clinical practice, we hardly ever saw anyone have an NDE-type event. Also, there had been many studies in the years since Meduna's work on the effects of increased carbon dioxide and these had not shown that it led to NDE-like states.

—*The role of drugs:* Scientists had also suggested that perhaps drugs administered at the time of death were causing NDEs. Examining the literature, this seemed doubtful, however, as studies had shown that NDEs associated with medication tended to be less complex than those without medication. Also, there had been many reports of people who had experienced an NDE without any medication. There were a number of cases, for example, of people who'd had an NDE just before an accident such as falling off the side of a mountain or being involved in a car crash.

—The role of the brain chemicals and receptors: Some scientists had hypothesized about areas within the brain that might be mediating the near-death experience. It's well known that certain drugs, including amphetamines, ketamine, and phencyclidine (LSD), can lead to quite complex hallucinations. The way in which these drugs work is by attaching to certain receptors found in the brain, which then activates the receptors and mediates their effects. For example, ketamine and phencyclidine attach to a receptor called N-methyl-D-aspartate (NMDA), and when this is activated, complex hallucinations can result.

Dr. Jansen, a doctor who specialized in the effects of drugs, had studied the effects of ketamine and had suggested that although it wasn't causing NDEs, they might be occurring due to the activation of the same areas of the brain that ketamine activated. He argued that when there's a lack of oxygen to the brain, the brain responds by releasing certain chemicals to protect itself. These chemicals can also activate the NMDA receptor. Therefore, certain features of a near-death experience, such as seeing a tunnel or a light, might be arising as a consequence of overactivity of this receptor in the same way that overactivity of the receptor in response to certain drugs could cause hallucinations.

This was a very well-thought-out theory that had unfortunately not been tested. It had a limitation in that the NMDA receptor is very widely found in the brain and is involved in many other activities at many other times without causing hallucinations. So it would not be sufficient to assume that its activity caused hallucinations or NDEs all the time, as in that case most of us would have hallucinations or NDEs most of the time! Also, NDEs really aren't like the hallucinations described by people who have taken drugs. Some scientists had, therefore, looked at other mechanisms.

When the body undergoes a major physical stress such as a serious illness, it releases morphine-like substances called endorphins. These can produce a sensation of well-being, happiness, and peace. It had been suggested by some researchers that the peaceful feelings occurring during NDEs might be a response to the release of endorphins. Other researchers had proposed that the intermediary for this process was another brain molecule (neurotransmitter) called serotonin, which can also lead to sensations of well-being.

It made a lot of sense to suggest that endorphins caused the peaceful sensations, although again, no one had tested this out in people with NDE.

2. NDE as a Type of Seizure: The Role of Temporal Lobe Epilepsy

Another view had been that the complex visions that took place during NDEs might have occurred due to activity in specific areas of the brain called the temporal lobes. In particular, NDE had been linked to a condition called temporal lobe epilepsy. The reason why this theory had been put forward was that activity in these areas of the brain had been shown to lead to complex hallucinations. I therefore set out to study this condition in detail.

I knew that during an epileptic seizure there was abnormal electrical activity in a specific section of the brain that led to specific changes in the rest of the body. For example, if there was increased electrical activity in the areas of the brain responsible for arm and leg movements, there would be a resultant jerking of the arms and legs, which is often what people associate with epileptic seizures. If, however, there was an abnormal change in the electrical activity of the visual areas of the brain, then people might see flashes of light or other visual images. That was why it was possible to have hallucinations during episodes of certain types of epilepsy, including the temporal lobe variety.

As I studied temporal lobe epilepsy, I became fascinated, although I couldn't see an obvious resemblance to NDEs. Temporal lobe epilepsy is associated with a number of specific features, which include a distorted perception of events, complex hallucinations involving sounds and visions, déjà vu experiences, and an abnormal aura starting in the stomach, which rises up the chest and can lead to panic attacks. If a seizure is prolonged, there can also be a loss of consciousness. In addition, there had been descriptions of patients being in "a state of unreality" and sometimes performing uncontrollable repetitive movements, or automatisms, such as chewing uncontrollably, continually grimacing, and even in some cases automatically undressing without being aware of what they were doing, or remembering it afterwards.

The fact that some people with temporal lobe epilepsy had described hallucinations that appeared to share some of the features of an NDE had led some researchers to propose that NDEs were also a consequence of abnormal function in this area of the brain. I didn't see enough evidence for this. If NDEs occurred as a consequence of overactivity in the temporal and limbic

areas of the brain, due for example to a lack of oxygen, one would also expect to see some of the other features of overactivity of the temporal and limbic areas, such as loss of memory, automatisms, and déjà vu experiences. Such features did not occur in association with NDEs, and when I examined the original scientific studies on overactivity of these areas of the brain, I noted that NDE-like features had not been commonly described.

Although I could see that the brain-based theories discussed in the scientific literature had been developed rationally and eloquently, as they stood they didn't seem sufficient to account for the NDE phenomenon. I had no doubt that the brain was involved with the near-death experience, but there had to be other explanations. I decided to look at the other theories.

PSYCHOLOGICAL THEORIES

The second major mechanism that had been put forward to account for NDEs was a psychological one. It had been suggested that although the experience could appear very real, it had actually been constructed in the mind, either consciously or subconsciously, in response to the stress of an encounter (or perceived encounter) with death, and did not correspond to a real event. In a way, it was similar to wish fulfillment—because people thought they were about to die, they experienced certain things in accordance with what they expected or wanted to occur. Imagining a heavenly place was, in effect, a way for individuals to soothe themselves through the stress of knowing that they were close to dying. It had thus been proposed that the near-death experience could be a form of depersonalization or dissociation.

Depersonalization is the process by which some people react to a frightening event. When this happens, people can abandon all sense of their own identity and completely separate themselves from the frightening perception. They form a fantasy and replace the terrifying experience with a pleasurable, dreamlike scenario that is more bearable.

Dissociation is a form of withdrawal to protect an individual from something very stressful. Under extreme circumstances, some people may detach from certain unwanted feelings in order to avoid experiencing their emotional impact. One trigger for such a sensation could be a situation that may appear potentially fatal. According to this theory, NDEs could be an unconscious defense mechanism in which an individual separates themselves

from specific activities or emotions in order to avoid their reality.

The main argument in support of the psychological theories was that many people who'd had a close encounter with death, such as those involved in near-fatal accidents, had described experiencing many of the features of an NDE just prior to the accident. This had been a feature of the cases described by Albert Heim, the 19th-century geologist who had compiled more than 30 cases of mountaineers who'd been involved in near-fatal accidents.

Furthermore, two medical researchers in the 1970s, Noyes and Kletti, had collected the NDE experiences of 104 people who had come close to death as the result of extreme situations such as mountaineering falls and car accidents, and they too had found that many of the experiences had occurred just prior to the accident.

Further evidence had come from a scientific study that had been carried out by Dr. Owens and colleagues and published in the medical journal *The Lancet* in 1990. In this study, the researchers had collected the medical records of people who'd described an NDE and found that not all of them had been critically ill during their hospital stay.

The "psychological comfort" theory proposed including not just the heavenly component of the near-death experience, such as seeing a bright light and entering a new domain, but also the resuscitation attempts that some people had claimed to have been able to watch while supposedly out of body. It had been suggested that the brain might simply be constructing that experience from previously stored memories. Most people are now quite familiar with what happens in hospitals through the many medical programs on television. Also, although the person might have appeared unconscious to the doctors and nurses, it has been suggested that they might have been only partly unconscious and therefore still able to gather information through their ordinary senses such as hearing. Patients who have been inadequately anesthetized have sometimes reported being aware of events that have occurred during surgical operations as well as being able to hear conversations between the medical staff. The difference between these and outof-body experiences is that these patients have simply not had adequate anesthesia, which is very different from people in a deep coma or even with no brain function reporting being able to "see" things that have subsequently been verified by medical and nursing staff. Nevertheless, this seemed to be an interesting theory. However, it had also not been tested.

One last untested psychological theory that I came across, which also struck me as interesting, was that an NDE could be a form of reliving the trauma of birth. A baby travels from the darkness of the womb to light and is greeted by the love and warmth of the nursing and medical staff, and so, it was proposed, the dying brain could be re-creating the passage through a tunnel to light, warmth, and affection.

TRANSCENDENTAL THEORIES

The third viewpoint that had been expressed in the scientific literature had been by far the most controversial. It had been suggested that an NDE might be a spiritual experience indicating the existence of a soul and providing a glimpse into the afterlife, as had in fact been claimed by the vast majority of those who had experienced it.

The experts arguing this had based their case upon a number of points. First, because the experience occurred universally and had been described all over the world, they argued that it was unlikely to be a hallucination. If it were, people of different cultures would be expected to have different experiences, as their memories would be dependent on their previous life experiences. Another argument against NDEs being purely psychological or hallucinatory experiences was that they had also been described by children too young to have any concept of death or an afterlife. The final argument put forward was that people experiencing an NDE had anecdotally reported being able to see things in places and at distances that they couldn't have perceived from their physical vantage point. Dr. Morse had described such accounts in children, and there had also been a famous case of a lady in Seattle who had reported being out of body when critically ill and had, among other things, accurately described seeing a tennis shoe on a window ledge.

Although this spiritual view had been proposed by scientists, it had not been popular with the scientific community. Many scientists, such as Dr. Blackmore, who had studied NDEs for many years, had argued against it, claiming that there was a lack of clear, independent corroboration in such cases.

THE NEED FOR FURTHER RESEARCH

At the end of my search through the scientific literature, I'd come to understand near-death experiences in much more detail. It had become clear to me that we really could not dismiss them as simple fabrications. The fact that they'd been described by so many people in so many different cultures and eras went against this. It was also remarkable that right across different times, cultures, and age groups, people coming close to death had reported a consistent set of experiences. This suggested very strongly that at the very least, NDEs offered a glimpse of what we would all experience at the end of our lives.

Unfortunately, one of the most disappointing aspects of neardeath experiences had been that despite the great interest by the public and the media in the 20 years since they'd first been described, relatively little scientific research had been done on them. This lack of research probably reflected both the obvious difficulties encountered in objectively studying people's experiences during the dying process and to some extent an underlying prejudice within the scientific and medical communities regarding the subject. A consequence of this lack of research had been that the true significance of the phenomenon had not been fully elucidated. This had meant that "experts" on the subject had usually expressed their underlying philosophical views rather than the findings of objective science.

The scientists whose research I'd studied had laid down the first few pieces of the jigsaw puzzle of the human mind at the end of life, but I could see that so much more research needed to be done. None of the main theories had yet been tested scientifically, and a major new approach was needed. I wanted to help solve this greatest of mysteries.

❑❑❑❑❑❑

CHAPTER TWO

SETTING UP THE SOUTHAMPTON STUDY

Finally, the day I'd been waiting for had arrived. I woke up early, dressed casually, and stood gazing out of the window across the almost deserted hospital parking lot. It was a Saturday morning, and not many people were working that day. My mind was busy. *Could it possibly work? Would it all happen as planned?* I really hoped so. I truly did.

It was a warm August morning in 1997. I drove to the small local hotel, Hotel Nirvana, to pick up Tony. Tony was a freelance film producer who used to work for the BBC science division and had worked closely with Dr. Fenwick in 1987 to produce a very good documentary on NDEs. He had traveled all the way from Sussex for this.

For a moment I thought back to the time, not that long ago, when I'd been looking for a break, an inspiring idea, a hypothesis, a workable method to move the subject of NDE research forward, and now here I was not only *with* an idea, but actually about to start the first-ever study of NDEs in Britain and the first of its kind anywhere in the world.

The break I'd been looking for had come almost ten months earlier, after I'd been offered a three-year postgraduate training program in internal medicine at Southampton General Hospital. This was a university hospital with a very good reputation. I knew that being there would provide me with the stability and time needed to conduct the research that I'd wanted to do since my time in New York two years earlier.

While I'd been very enthusiastic, I'd also been realistic. I knew that enthusiasm alone wouldn't be enough, and from a practical point of view it would be extremely difficult to carry out a study on NDEs. There were numerous problems. First, how would I find the time for research? It was

almost unheard of for people to set up their own research projects during this period of their careers. Working clinically as a resident really left very little time to do anything else, and any spare time I had needed to be dedicated to studying for the MRCP, or board examinations in internal medicine. Also, even if I somehow found the time, how would I actually manage to persuade my bosses and senior colleagues to support a study on NDEs in their hospital? The subject generally had a negative connotation in the medical community, as doctors still associated it with "paranormal" research. Bearing this in mind, I also had to think very carefully about the possible effects on my own career. I was a young doctor just starting out, and I didn't want to tarnish my reputation before I'd even started. Maybe this was why others hadn't attempted to study NDEs in the past. I didn't know quite what to do, but decided to move forward anyway.

My inspiration had come during one of my meetings with Dr. Fenwick the previous autumn. One evening he said to me, "There are two areas of research that I've been thinking of recently. The first is the study of NDEs in those who are congenitally blind. There have been anecdotal reports of congenitally blind people who have never seen anything in their lives but during a critical illness have described separating from the body and being able to see things for the first time ever! They've reported being able to recognize colors and images that they had only heard of before."

I thought this was fascinating, but it was Dr. Fenwick's second idea that really intrigued me. He went on to say, "The other area that we could investigate could be the use of hidden targets to determine whether the people who claimed to be out of body really had been able to see things from the ceiling."

Looking very perplexed, I said, "How could we do that?"

"You place things around the hospital rooms or operating rooms so that they're not visible from ground level but only visible when viewed from above, say, for example, from the ceiling."

Looking even more perplexed, I said, "Well, how can you do that? Whatever you put in the room would be visible from ground level as well, so how would you ensure that it was only seen from the ceiling?"

Dr. Fenwick leaned forward, picked up a large white envelope from his desk and said, "Like this."

He then drew lines and shapes on one side of the envelope, stood up, and

lifted the envelope above his head so that the side with the lines and figures faced upwards toward the ceiling, and the side that was clear faced downwards.

"If you look from below, what do you see?"

"Just a white envelope," I said.

"Exactly, and if you could look from above, what would you see?"

"The lines!" I said excitedly.

"Exactly—you can't see them from below, but you can from above. We need to have targets such as this in the operating rooms so that they're only visible if someone is at the level of the ceiling. Then we can test the claims of those who say they've watched doctors and nurses working from above."

This idea seemed so simple yet so brilliant. I was thrilled! Sometimes the simplest ideas really were the best. This was truly what was needed. There had been so much debate regarding this aspect of NDEs in the literature and in the press that it really warranted a study. After all, it was the only aspect that was amenable to objective testing. All the others, such as seeing deceased relatives or a tunnel and light and entering a heavenly domain, were really personal, but the out-of-body component was the part where people described what others had said and done, and so it could be tested and verified.

All we had to do was get a large enough group of subjects—say, for example, 100 or 200 people who claimed to have been up by the ceiling looking down at the doctors and nurses while near death. If none of them could identify the images, then this would suggest that they must have imagined being up there. In this case, we would have to conclude that perhaps the near-death experience was simply a trick of the mind, maybe just an illusion or a hallucination. If, on the other hand, 100 to 200 people all identified the images without themselves or anyone else knowing about them beforehand, then we would have to accept their claims!

This would, of course, pose a huge problem for us scientifically, as our science simply couldn't account for it. Nevertheless, we had to be open-minded to claims that challenged our scientific beliefs and assumptions. The NDE evidence was anecdotal, but many other areas of research had originally started off with anecdotal evidence and then progressed to great discoveries. In the case of NDEs, there was now a lot of evidence that could no longer be ignored, and we had to let the questions be answered by the objectivity of

science, not our own personal opinions. After all, we didn't know what happened to the mind at the end of life—for that matter, we didn't even know the nature of the mind. In effect, by performing the study we would be testing the nature of human consciousness and its relationship with the brain at the point of death. This was really what had intrigued me ever since I'd met Desmond. I was even more excited when I realized that we would be the first-ever group of researchers to test the theories for the causation of this phenomenon scientifically.

"That is the study that I'd like to do," I enthused. "The study of NDEs in the blind is also very interesting, but this is the one that I think will really help us move the whole subject forward. Nothing like this has ever been attempted before, as far as I can see."

We agreed to move forward with this idea, and I left that meeting very excited indeed.

❑❑❑

Although the concept was truly novel, it wasn't enough on its own. We needed to test all of the three main theories proposed for the causation of NDEs, which no one had ever done before. I really wanted to test the "dying brain" theory by examining whether lack of oxygen, increased carbon dioxide, or drugs given during a hospital stay caused NDEs. I also realized that we needed to test the psychological theories by examining the effects of the individuals' cultural and religious backgrounds. Finally, we had to test the theory that an NDE was a transcendental event by exploring whether people claiming to be able to see events from the ceiling had really been able to do so. This idea wasn't compatible with mainstream scientific views and also went against what I'd been taught about the mind and the brain, so I felt skeptical at times, but I realized that we'd only know if we tested the theory objectively using the hidden targets that Dr. Fenwick and I had discussed.

Now the only question that remained was how to define being "near death." One of the main difficulties and drawbacks with NDE research so far had been that it had been almost impossible to ascertain objectively and medically how close to death people had been. This was a limitation in almost all the studies that I'd seen.

The difficulty was that in all the studies, the reported NDEs had often

taken place many years earlier, and due to a lack of medical records it had been impossible to see how close to death the people had really been. Even if the records had been available, it would have been extremely difficult for any researcher to go back and identify exactly when during a hospital stay many years earlier a certain individual had had an NDE. Although many of the people involved in the studies had been admitted to the hospital with severe illnesses such as a heart attack, stroke, meningitis, or a severe episode of pneumonia, that didn't necessarily mean that their lives had been in danger. Even being in the intensive care unit didn't always mean that someone's life was in danger.

So a method was needed to identify a group of people who were objectively on the brink of death. This hadn't been done in any of the previous studies. So far, the term *near death* had unfortunately been used fairly loosely. In his book *Life After Life*, Dr. Moody had defined it as "a clinical situation that would normally have led to the death of the individual without medical intervention." However this was still not accurate enough, as I knew from experience that someone could have a potentially life-threatening illness, but due to medical intervention, that illness would often not threaten their life. In fact, it was our aim as doctors to ensure that a patient never reached a life-threatening situation by initiating early and appropriate treatment. Also, I knew very well from my medical practice that many people with severe illnesses suffered hallucinations. Therefore, we needed to be able to differentiate between the hallucinatory experiences that were taking place during severe illnesses that were not life-threatening and the experiences taking place at the point of death.

In order to overcome this obvious difficulty, it was essential to study the experiences that had occurred during an objective period of clinical death. For this we needed a model of the dying process that would mimic the same biological events that take place in the body when an individual is actually dying. In clinical practice, death is normally diagnosed when the heart stops beating, the person stops breathing, and the brain stem (the area of the brain responsible for maintaining life) and hence the rest of the brain, stop functioning. The ideal model was, therefore, one in which all of these criteria were met—namely, a cardiac arrest.

This was a good model for a number of reasons. First, in this condition patients develop two out of the three criteria of clinical death—no heartbeat,

no breathing—and also develop the third—fixed dilated pupils of the eyes[1]—within a few seconds due to the loss of brain (and in particular brain stem) function. Second, it mimics the initial period of the dying process biologically. Finally, irrespective of the cause of death, the last steps in the dying process are for the person to stop breathing and the heart to stop beating—in other words, a cardiac arrest. Therefore, the mechanism by which everyone dies is a cardiac arrest, and consequently, what people experience at that time can provide us with a unique understanding of the experiences that we will all have as we die.

Some scientists, however, had argued that NDEs could not really be considered experiences of dying, as obviously the people hadn't actually died, but had been alive to tell their stories. Although I could see why this had been argued, I didn't completely agree, as I knew from clinical experience that death was a continuum, and certainly in the early phases was potentially reversible. That was why we tried to resuscitate patients after their heart had stopped. When somebody died, or in effect had a cardiac arrest, there was a period in which the vital organs, particularly the heart and lungs, could be restarted. If a significant period of time passed, however, then the vital organs would develop permanent damage due to a lack of nutrients, particularly oxygen and glucose, and this would be irreversible and would lead to "death." This is the death we usually describe when talking in lay terms.

During the next few months, we began to develop Dr. Fenwick's original idea into a more global study of NDE in cardiac arrest. Throughout this time, Dr. Fenwick and I kept in close touch and discussed all the various aspects of the study together.

The first aim of the study was to determine what experiences, if any, people had during a period of clinical death using cardiac arrest as a model. Obviously NDEs had been described for many years, but we couldn't be sure that what people experienced during a cardiac arrest would actually correspond to that description. People might have no experiences or even completely different ones. This needed to be investigated. Nobody had yet done a prospective study (that is, when the patients are followed forward in time), so we didn't know.

The second aim of the study was to determine the frequency of NDEs

(should they have occurred) during cardiac arrest, as this hadn't been investigated before either.

Finally, we wanted to investigate the significance of any NDEs and why they occurred. For this we planned to investigate the three broad theories—brain-based, psychological, and transcendental—put forward in the scientific literature.

In February 1997, I started my job at Southampton General, a large hospital with around 1,000 beds and many specialist units, including various intensive care units, such as cardiology and neurology. I was due to rotate through many of the different specialties.

Working as one of the front-line medical staff was very useful, as it meant that I had to deal with critically ill patients on a regular basis. I was the first person to attend the hospital cardiac arrests when I was on call, so I gained experience in managing and resuscitating these patients. I also managed many other medical emergencies on a regular basis, such as heart attacks; and respiratory, heart, kidney, and liver failure.

In my first post, I worked for Professor Cyrus Cooper, a brilliant academic with an incredible memory and all-round knowledge of medicine. He was also a very kind and supportive doctor to work for. One day as we were walking down the corridor, having finished our rounds, I nervously told him of my interest in NDEs and my desire to set up a study in Southampton. To my surprise, he showed a lot of interest and became very eager to help. At the end of our conversation, he suggested that I speak to the head of the coronary care unit, Dr. Derek Waller, and also the head of emergency services, Dr. John Heyworth.

"You won't be able to do this study without Dr. Waller and Dr. Heyworth's help. Why don't you go and speak to Derek Waller and tell him that I sent you?"

I did, but Dr. Waller's first reaction was bewilderment. He just looked at me and said, "Have you done your MRCP exams yet?"

"No, not yet. I have only just started the medical rotation." He looked back at me as if to say, "Well, don't you think you should do your exams first?"

I thought, *Well, that's that then. He definitely won't support me. He obviously isn't very interested.*

Dr. Heyworth was more supportive, however, and agreed to let me use the emergency areas if the study went ahead.

A few weeks later, while working on the ward, I bumped into Dr. Waller again. He came up to me and said, “I was thinking about that idea of yours the other night. Have you thought about it any further?”

I was taken aback, but also very happy that he’d raised the subject with me again.

“Well, yes … I’d like to do the study, if possible, and I wanted to ask if you would mind helping me with it.”

The whole thing obviously sounded a little strange to him, but after I’d explained it in more detail, he agreed to help. As time went on, he also took more of an interest and started telling me of discussions that he’d had with other medical colleagues and their views.

With his support, we submitted an application to the local ethics committee, and to my delight got a letter back saying “Approved”! We’d taken a huge step forward, as we now had formal permission to start the study.

As the summer approached, I wrote to all the other senior doctors in the medical unit of the hospital and informed them of our intention to start the study and possibly recruit some of their patients. I had replies back from all of them, and thankfully no one objected. Some found the whole proposal quite interesting, even entertaining. One wrote back saying, “No, I have no objection. … This proposal really brightened up a dull Friday afternoon!”

One day while I was talking to Dr. Waller about the project, he said, “I was thinking you should also write to Professor Douglas Chamberlain for some advice regarding the aspects of the study related to the heart. He may be able to help you with that. Also send my regards.”

Douglas Chamberlain was very famous in the world of cardiac arrest and resuscitation. He was a professor of cardiology, and for many years had played a leading role in research. His guidelines on cardiac-arrest-resuscitation management were now standard practice worldwide. To my mind he was something of a medical celebrity. I agreed to write to him, but didn’t really expect a reply. I thought at best I would get a standard response saying, “Thank you for your letter, but no, thank you.”

However, a week later I received a very interesting letter back from Professor Chamberlain in which he related the case of a man he’d resuscitated many years earlier while working as an army doctor. It had happened in 1960, just around the time when modern resuscitation techniques

were being developed, and Professor Chamberlain had, of course, played a leading role in this. One day, after prescribing a drip to a patient on the ward, he'd gone to the clinic, when the head nurse called him back to the ward in a rush:

> On my arrival, the patient did not have a pulse, so I started resuscitation. Techniques were more primitive then, but I persevered and then continued until eventually the patient's heart restarted. The man eventually made a full recovery and then started to tell me that during the resuscitation process he had been at the ceiling watching me working on him.
>
> He also went on to tell me that without wanting to sound ungrateful, he really didn't want to come back! We later discovered that the manufacturer of the drips had supplied contaminated products, and this had caused his cardiac arrest.

I hadn't expected this! I guess it wasn't really surprising, though. Professor Chamberlain had dealt with many cardiac-arrest patients, so it was understandable that he'd encountered a patient with an NDE. But his perspective gave me new insight. This was the first time that I'd come across an NDE case recounted by a doctor looking after a patient. (In the following years, other cases followed from specialist doctors looking after critically ill patients.)

We were almost there now. We had all the permission we needed to start. As this was a very new type of study and hadn't been performed before, we decided to conduct it on a small scale, essentially as a pilot to start with, and then, depending on the results, perhaps take it further. We actually had no choice about this—Dr. Fenwick had around £3,000–£5,000 (approximately $5,300–$8,800 U.S.) in his research budget that wasn't being used, and that was all we had for the entire study!

The plan was to identify all the people who'd suffered a cardiac arrest on the emergency, coronary care, and medical units of the hospital and had survived. They would be interviewed as soon as possible afterwards, typically within two to five days, and would be asked if they had any memories from the period of cardiac arrest. The interviews had to be done within a few days, as there was evidence from psychological studies that people could start to falsely construct events in their minds as time went on.

During the interviews, we would in no way mention anything related to death, dying, or NDEs, or anything that might suggest those issues to them. The question would be very simple: "Do you remember anything from the period in which you were unconscious?" If a patient replied, "Yes," we

would then allow the person to describe what happened in more detail and would give the experience a score based upon the Greyson Scale. This would allow us to define the experience either as an NDE or not. It would also provide us with a measure of the depth of the experience.

Those patients with an NDE would be placed in one study group, and those without in another group. The two groups would thus be the same, particularly from a biological point of view, as they'd both had a cardiac arrest and reached the point of clinical death, except that one group had experienced an NDE, while the other had not. In this way, we had a well-matched group that would act as a "control" for those who'd had an NDE.

Data would then be gathered from the medical records regarding each patient's oxygen, carbon dioxide, sodium, and potassium levels, and these would be compared to see if there were any differences between those who'd had an NDE and those who had not. We would also look at any differences in the drugs administered to the two groups. I was particularly interested in the oxygen levels, both to test the "dying brain" theory and to examine whether a lack of oxygen played a significant role in causing NDEs.

During the study, we would also ask patients about their religious beliefs to see if there was a relationship between people's religious backgrounds and their near-death experiences. For example, would Christians have a different NDE from atheists and nonChristians? This would test some of the psychological theories.

The final aspect of the study would be to test the claims of those who'd had out-of-body experiences. The original idea that Dr. Fenwick had was to place different symbols such as crosses on the top of hospital monitors in each room so that they'd only be visible from above. The problem with monitors, though, was that they usually tilted downwards, so it was impossible to place figures or images on them that were truly not visible from below. Therefore, an alternative method was needed.

I thought back to the envelope that Dr. Fenwick had originally used to show me his idea. *We should simply replicate that,* I thought. I also discussed my ideas with another distinguished doctor. He said, "You should use different images such as writing, pictures, newspaper articles, et cetera." That seemed like a very good idea, as it would obviously be much harder for a patient to have imagined the detail that would be needed to identify a newspaper article or a picture than a simple cross. We therefore decided to

prepare special boards and place an image or writing on them.

The head of health and safety at the hospital insisted that our boards be fireproof, so the only thing we could find that was definitely going to be acceptable—as it was already hanging all over the hospital—was the material that the ceiling tiles were made of. We therefore purchased some 150 of these tiles and had a local print company attach the pictures, images, and newspaper articles onto them. We also had to purchase a special type of hanging material and clips that would allow us to hang the tiles from the ceiling. The whole cost of preparing these items was around £1,500 (approximately $2,700 U.S.). Before we were due to set up the study, I had to collect and store the tiles; the material was very friable, so you can imagine what a mess they made of both my car and the room!

Finally, we were ready to start. The excitement that morning was truly palpable. We had to cover up all the images so that when we took the boards onto the wards, no one would know what was on them. We especially had to ensure that none of the staff or patients could see what was on them, as that would have invalidated the study. I was really very strict about this aspect, because if a member of the staff had seen what was on the boards and someone had identified it, then we would never have known whether that staff member had told the patient or whether the patient had really identified it for him- or herself.

❑❑❑

I arrived at the hospital with Tony, the freelance science producer. He wasn't producing a program this time; he was just going to be a cameraman and record how we set the study up. He had kindly agreed to do this free of charge, as he had a professional camera and was interested in the study.

I had lots of other help, too. There were three visiting German medical students; two of my friends, George and Dylon, joined us later that day from London; and even my mother came to Southampton. We had the mammoth task of covering up all 150 boards and then taking them around to each of the eight wards, plus the coronary care unit and the emergency areas, including the resuscitation room. The aim was to place a target between every two beds so that something would be visible from every corner of the room and above every bed. Where would people claim to have looked down from? Would

they claim to have gone up just a few inches or right up to the ceiling? We obviously didn't know, so we had to cover all areas of the room.

Setting up the targets took the entire weekend, but by Sunday evening we'd installed all 150 on the wards. When it was all finished, we heaved a great sigh of relief and walked down the corridor feeling exhausted but very pleased with what we'd done.

As we departed, I took a last glance back at the wards we'd just left. It was a strange feeling. These were the wards that I'd worked on every day for the past six months, and they were now the firstever wards anywhere in the world to have been fitted with a huge number of boards with an image facing upwards to test NDEs. But as I turned around and continued walking out of the hospital, I knew that the real work was just beginning.

❑❑❑❑❑❑

1The response of pupils to light is mediated by a reflex situated in the brain stem, a structure situated at the base of the brain that is involved with vital life processes such as regulating breathing and heartbeat. When the brain stem stops working, this reflex is lost. In cardiac arrest, it is lost, but drugs may be administered, such as epinephrine and atropine, which can also make the pupils look large and fixed and hence confuse the issue. We know, however, from the loss of other reflexes, such as the gag reflex (the reflex in the throat that stops food or other materials from going down the windpipe), when this vital part of the brain isn't working.

CHAPTER THREE

WHAT IS IT LIKE TO DIE?

Soon afterwards, I quickly learned two very important lessons in life. First, I learned never to give someone a piece of information and then ask them not to tell other people—well, at least not unless I wanted everyone to know! Second, I learned that although research is wonderful, as soon as it starts, it becomes a great test of patience and mental endurance!

Two months had passed since we'd installed the targets on the wards, and everything was going well—except for the fact that nobody had had an NDE! Still, we'd weathered the initial worries and concerns, and I generally felt more comfortable with the study. The first few weeks after we'd installed the targets, I'd gone through a period of worry. Each day I would feel really uneasy about what I would find when I walked into work. Although we'd tested the strength of the boards and the connections as we had set them up, I still worried about whether one of them would fall down in the middle of the night. That was actually my biggest fear!

The boards really were an eyesore, so it would have been impossible not to draw attention to them. We'd told everyone on the wards that they were for a study, but hadn't told them the details. If anyone asked, I would say, "It has to do with dust collection." The only people who'd been informed of the real reason for having the boards were the senior nurses who were in charge of the wards and the senior doctors—in total, perhaps around 20 people. I'd asked them all to be discreet and not to tell anybody else the reason for having the boards. I had particularly emphasized this to the senior nurses on each ward and had suggested that if anyone asked, they were simply to say that they were for a study having to do with dust collection.

Unfortunately, one evening one of the nurses who knew about the boards

decided to tell another nurse. I later heard about their conversation, and it had gone something like this:

"Do you know what these boards are actually for?"

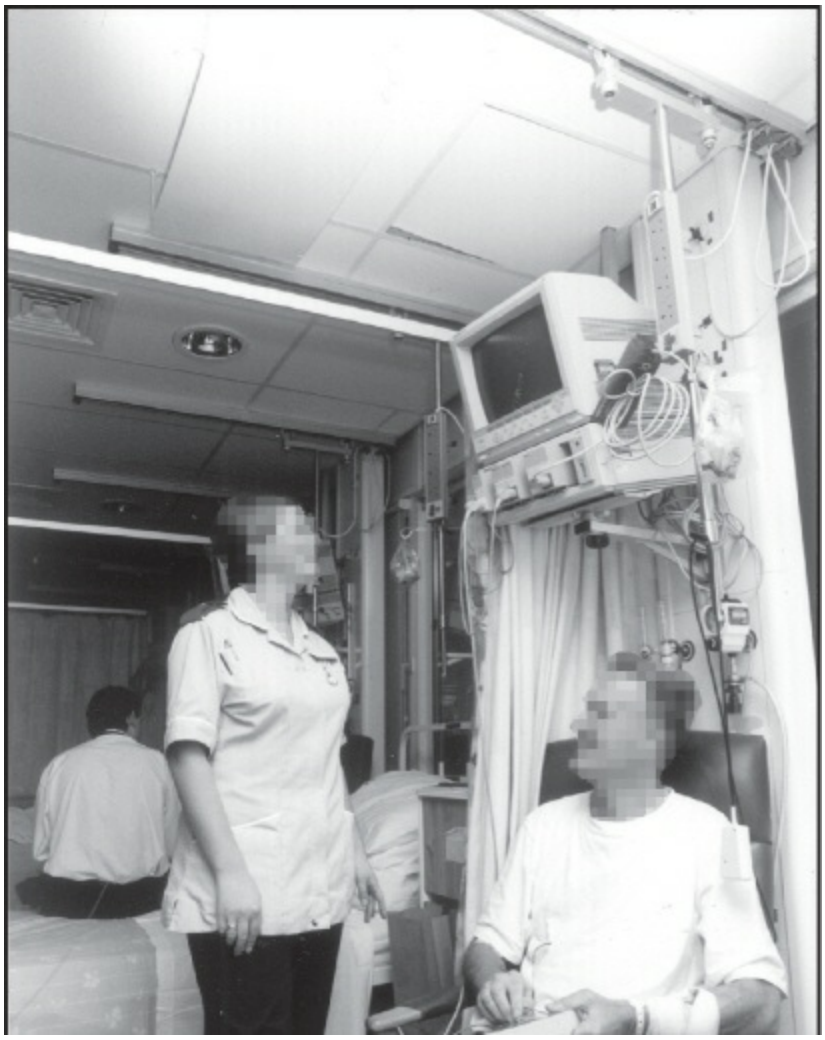
"Yes, I think they're for a study to do with indoor dust."

"No, they're actually to test people who may have had out-ofbody experiences!"

"What? What do you mean? What are you talking about?"

"Really, they're there in case someone describes being out of body! Trust me. If you don't believe me, then take a look!"

That obviously caused a lot of excitement and broke the monotony of the night shift! The nurses started calling around all the other wards telling others what the boards were really for. I can only imagine the shock on their faces. During the next few weeks, some nurses climbed onto chairs, stools, and even stepladders to try to see exactly what was on the boards! One day one of them even broke one of the boards as she leaned over to look at it! When I asked her about the shattered board hanging from the ceiling, she initially insisted, "It just happened spontaneously," but once I explained that none of the other boards had broken or even come loose, she confessed and apologized. During the setting-up phase, we had thought of many possible outcomes with the boards, but not that they'd have to take the weight of a person! They really weren't designed for that sort of thing.



After the study finished, we kept the boards on the coronary care unit only. In this picture, in the corner of the coronary care unit above the bed, you can see a white board hanging from the ceiling (arrow). This is an example of the second version of the targets, which actually blended in with the ceiling and so drew far less attention. On the surface facing the ceiling, various images were attached. The first version of the boards had been made of inverted ceiling tiles, which were a real eyesore! It was one of these first ones that was broken by an over-curious nurse one night! The second version was made of plastic, so it was a lot easier to manage. I used to clean these boards and change the images regularly, even though I've never been really keen on heights! We kept the boards suspended for over three years waiting to set up a larger study, but in the end we had them removed until a newer study could be set up.

News of the study soon trickled down from the ward nurses to the student nurses, medical students, and even the hospital volunteers who served tea and coffee. Before long, everyone knew about the study. One day, when a student nurse was asked by a patient what the board hanging over his head was for, she replied, “Oh, that’s in case you have an out-of-body experience, sir!” It really wasn’t very good at all! I had been extremely naïve, and now I was paying the price.

Although I really wasn’t very happy about all the interest, there was very little I could do at that point. I just had to wait and let the excitement settle down. I also had to assume that all our writing and pictures had been seen and hence invalidated. So we had a big problem! The only way around it would be to install new images once all the interest had diminished. In the meantime, I just carried on with the study. We could still collect data about NDEs, as the only area that had been compromised had been any potential out-of-body claims. Eventually, in the months that followed, I replaced all the pictures very discreetly while “cleaning” the boards during my weekends off. This was something I had to do on a number of occasions. I also made sure that no two boards had similar images.

By this time, things had all begun to fit into a simple routine. We had employed Becky, a very bright nurse, to help us with the study. She’d worked as a nurse at the hospital before and had now gone on to the university to study for a master’s degree. This was ideal for her, as it meant that she could work part-time. She was extremely enthusiastic, conducted most of the interviews, and helped us enormously throughout the study.

Every day we used to check to see whether there’d been a cardiac arrest in the hospital, and if so, where. This was done through the hospital switchboard, as they had an accurate record of every cardiac-arrest call that was put out. Some days there had been no cardiac arrests, and some there had been many. After identifying a specific ward, we would then go there and find out who’d had the cardiac arrest and whether or not they’d survived. Since only 20 percent of cardiac-arrest patients would have been expected to live, the vast majority had not, but if they had, we would check to see whether they were medically fit enough to be approached. Usually they would not be well enough for at least a few days, although if the cardiac arrest had been short-lived, they could speak sooner.

When they were well enough to speak, we would say to them: “We’re

trying to understand more about what people experience when they're in a deep coma. I understand that you were in a severe coma a few days ago. Do you remember anything from the time in which you were in a coma? Do you have any specific memories?"

Most people would at this point look at me in a strange way as if to say, "Well, what kind of doctor are you? Of course not—I was in a coma!" After that, they would just say, "No."

We would then look at their medical records and take down the relevant information regarding their oxygen, carbon dioxide, and sodium and potassium levels in the blood from the time of the cardiac arrest. These were our control group of subjects.

❑❑❑

Things were progressing nicely until one day I received a call out of the blue.

"Is that Dr. Parnia?"

"Yes."

"Are you the doctor who's doing a study into dying and outof-body experiences?"

"Yes."

"Oh, I've been looking all over for you—I'm glad that I've found you! I am Marilyn from the hospital public relations office. I've had a number of inquiries from the local press about your study. They're very interested in your work and have been calling me up, desperately seeking to interview you."

Oh no! I thought. That was all I needed! In hindsight, of course, I shouldn't have been too surprised by the call. There had been so much talk inside the hospital that it was only a matter of time before the news spread out into the community. But I really didn't want any further publicity.

"I'm not at all keen to speak to them. I don't want to speak about the study until it's been completed."

"Well, that's up to you. I can tell them that if you want, but the problem is that they already know there's something going on in the hospital, so if you don't speak to them, then they'll write something anyway, and it may be very inaccurate. This way at least you have a chance to tell them what you want

them to know."

I could see that Marilyn had a good point. It would be in our best interests to give the correct information. So I agreed to hold a press conference at the hospital. I was really afraid of getting all the wrong headlines anyway, but I really didn't have a lot of choice in the matter.

That day I was interviewed by two reporters from the local newspapers and a local BBC radio reporter. Thankfully it went very well. In fact, the press were very good and respected my concerns regarding the need to keep certain aspects of the work—particularly the boards—vague.

As time went on, I felt much more comfortable talking to the press and took part in a number of other interviews. At the end of one of them on national TV, it was announced that those who'd had an NDE could write to me at the hospital. I didn't know what to expect, but I waited in anticipation.

The following day I received 40 or 50 letters, and I continued to receive correspondence regularly for almost two weeks afterward. At the end of this period, I'd received reports of almost 250 NDEs and out-of-body experiences from the community. After subsequent press interviews, other people also wrote to me. In total, I collected in excess of 500 cases that year.

These letters were truly enlightening. While the cardiac-arrest study went on, I concentrated on reading them. Up until then, my knowledge of NDEs had been based on what I'd read in books or scientific publications. These firsthand accounts provided a real eyeopener and took my understanding of the subject much further.

Many of the people who wrote to me also accepted my request to attend an interview at the hospital, so I was able to study their accounts in detail. During this time I became even more astonished and touched by the mystery of NDEs and the profound effect they had on those who experienced them. Many of the people I met or who sent their accounts to me had been positively transformed by their experiences, and had done astonishingly humanitarian things afterward.

It became quite clear that there was a common thread to these experiences. The accounts seemed to confirm Moody's original description that coming close to death was a largely pleasant experience for the majority. Certainly the people who'd written to me commonly described feeling peaceful and joyous, seeing a bright light, seeing a tunnel, seeing deceased relatives, entering a heavenly domain, reaching a point of no return, and having a life

review, as well as separating from the body and watching events from above. Many had now lost their fear of death and had been positively transformed, drawing inspiration from their experience to go on and perform altruistic work with a sense of humility. I learned so much from all the people who shared their NDEs with me.

One of the most consistent features that I came across was a great sense of calm and peace, which for the majority of people occurred in the early stages of the experience and then lasted throughout the NDE. In many cases, people described becoming pain-free, calm, and peaceful before going on to have the neardeath experience. One woman wrote:

> I suffered a gynecological hemorrhage and was admitted as an emergency to hospital. … It happened again … this time it was worse, and I was lying in a pool of blood. The doctor was called, and there was a lot of urgent activity around my bed. . . . That was the last thing I remembered. Then I was high on the ceiling of the ward looking down upon the bed (which seemed to be a long way down) and saw the doctors and nurses around the bed working on the person lying there. I was surrounded by a strong light. I did not go through any tunnels. I was not frightened—in fact, I was very happy, very peaceful and in awe of the wonderful light all around me. The light was so beautiful—brighter than the clearest sunshine and yet not dazzling. I had never seen such light before and never felt such peace.

Many other people also described an out-of-body experience as well as the sensation of seeing a bright, warm, welcoming light. The out-of-body experience was described as a sensation of separating from the body and being able to watch it, and events that were taking place, from a point above. Once in an out-of-body state, people typically described feeling very "light" and "peaceful." I noticed that they often inadvertently described themselves as the part that had separated from the body. For example, they'd say, "I was at the corner of the ceiling, looking down at my body. While at the ceiling I thought to myself, *What is my body doing down there?*" The "I" part was always the part at the ceiling, and not the other way round.

Many recalled very specific details about events that had actually taken place during their experience. One woman explained:

> . . . during my operation I was floating around the operating room. I could see the surgeon and nurses working on my body, although I cannot now remember how many people there were. I could also hear their conversation … the surgeon said he would leave the wound open to let it drain, as the appendix had burst. He then visited me on the ward afterwards to explain what he had done, and I already knew as I had heard him. He said I couldn't possibly have heard him and suggested that a nurse had been to my bedside and told me. … I did not tell him I had seen the operation being performed. . . .

As well as highlighting the ability to recall "seeing" specific details and describing the self as the part that had detached from the body, this woman's case also illustrated the common reaction of disbelief from the medical and nursing staff when told about specific things that they'd said or done. Another woman wrote:

> I was pregnant … in and out of hospital because I had a blood disorder. … The blood was pouring out of me during the delivery, and I had to have 24 stitches. … I can remember so vividly being above and to the right of the bed in the delivery room at the head end in a white-like tunnel, but it was white, absolutely brilliant white. … I looked down and I could see Dr. Gallagher. I could see what he was doing, and I saw him run 'round the bottom end of the delivery bed … he must have forgotten [a bucket] was there because I saw him kick it in his haste to get 'round the other side, and he kicked this bucket, and it knocked into a trolley with all the instruments on, things like bowls, etc., and that trolley whizzed across the room and hit the wall. It didn't tip right up, but you could see things falling off it, and he then came 'round to me on my left-hand side and I saw him thumping on my chest, thumping and thumping.
>
> I heard nothing, I could see nothing, no sound whatsoever. I just saw what he was doing. … It was peace, it was peace, it was absolute peace. … I just looked down at myself … I could possibly say it was a tunnel where you were looking down [from], but all this light was around you, it was a brilliant light … and then there was a noise, a terrible noise. … I just said, "Let me go back, it was beautiful. …" The next day I spoke to the doctor, and I was telling him what he had done, and he was furious and wanted to know which nurse had told me!

There were many similar cases in which the individual described an interest in the events that had been going on around them. Another woman wrote:

> This experience occurred following a complication of the delivery of a child. … I saw myself lying flat in the bed, surrounded by different monitors and drips. I felt myself "float" over to the monitors on the other side of the room, looking at the data on screen. At the time I could not take in what the monitors were showing, despite my medical background. I then "floated" over to where the nurse was standing near a board. She was writing at the time, and I looked over her shoulder. Again I had difficulty in understanding what exactly was the problem with me. But during this time I did not feel frightened or threatened, but I knew who I was. . . .

The people who wrote to me were not necessarily religious. Here is the account of someone who described herself as a "practical, nonreligious" nurse. She had been admitted to the hospital for an operation to remove her womb and had had an internal hemorrhage afterward:

> I was awake and aware of my surroundings. A nurse came in to take my blood pressure every half hour. On one occasion I remember her taking my blood pressure and then running out of the room, which I thought was unusual. I don't remember anything more after that consciously, but I was then aware of being above my body as if I was floating on the ceiling and looking down at myself in the hospital bed with a crowd of doctors and nurses around me.

It seemed clear that there was something wrong, but I don't think I had had a cardiac arrest because I was not aware of anybody jumping up and down on my chest or doing any resuscitation. I could hear people talking about me, and there was some concern. This seemed to go on for probably about 5 to 10 minutes, I would think, then I think there was a blank period again because the next thing I remember was actually … waking up still in the same bed and seeing people in hospital theater gowns standing around me. I asked them what they were doing, and they explained that I had some bleeding and that they were looking for the signs of the bleeding … it took me by surprise, as I don't have any religious beliefs or position on the afterlife. At that stage I had never heard of that sort of experience. . . .

I was quite surprised to have what appeared to be a sort of mystical experience, because I don't believe in ghosts or spiritual experiences at all. I subsequently discovered by looking at my own chart that my blood pressure had been recorded at 50/0, so obviously I'd had a fairly massive internal bleed!

Some people described leaving the body like taking off an item of clothing or shedding a layer of skin. A man from New Zealand who had been involved in a road traffic accident wrote:

When I came to, someone was holding me down on the road, and I was having a lot of difficulty breathing. … I lapsed into unconsciousness again and revived partially once more in the Intensive Care Unit. … I realize now that this must have been very soon after the accident. I knew I was in a different existence and in my unconscious state I remember thinking, *So this is dying.* I never thought it was so easy. It was like taking off your coat. … The one thing that stood out was that my spirit moved separately from my body. … In some strange way, however, it was still part of me.

Although the majority of people described being able to observe events in the vicinity of their body, some described viewing events beyond their own environment. A man with a heart attack recalled:

I was rushed into the hospital with severe pain in my left arm and jaws. … I had a heart attack. The next thing I remember I was flying outside the hospital grounds over people and cars. I was lifted up over two rows of trees into the sky, between two beams of light. I was aware that I was on my journey up. It was not until I came to a sudden halt that I was gripped by fear. I called out loud, "Oh well, there is nothing I can do now, I can't get back." I remember being afraid to look back. Then I was taken farther up. I came to a halt. I saw … there were billions of stars. . . . Then I found myself awake in my hospital bed. … The doctor said, "I am afraid we lost you and had to pump electricity through you."

Others described being attached to the body by a line or a cord:

I remember the out-of-body experience I had as a child of 11. … I was not at all frightened. In fact, I felt at home, but also aware I couldn't stay out of the body too long. I could see I was attached to a thin line, a sort of lifeline, but I also saw the doctor who was dressed in the white coat busy at some machine. . . .

Many people described seeing a tunnel during their NDE. This was

depicted in different ways. The majority described it as a long, dark tunnel, but others described it in other ways, such as a kaleidoscope, or a tunnel with colored tiles on the sides. After actually talking to the people, it became clear that although in some cases their descriptions seemed different, they all seemed to be referring to the same concept. Often people also described seeing a bright light at the end of the tunnel, which was usually portrayed as being bright, warm, and welcoming.

Some people simply saw a tunnel, while others described actually going through it. The sensation of traveling through the tunnel was at times described as simple movement and at other times like being pulled through. Those who described going through the tunnel sometimes recalled arriving in a beautiful gardenlike place. In many cases, the sensation of going through the tunnel was associated with other NDE features, such as encountering a being of light or seeing deceased relatives at the end of the tunnel.

One person wrote:

> I … went into anaphylactic shock. I "died" and saw all the old relatives who have passed on. There was a large tunnel, and all these people were calling me to join them. I started to go toward them, and then my husband came and found me and revived me. . . .

Another wrote:

> I was floating or flying down a tunnel. People were beckoning me to keep going … when suddenly I came out of the tunnel into a beautiful light, a garden of lovely bright colors that disappeared very quickly and I was back in the hospital bed. . . .

Another person described the tunnel walls:

> I remember going down a tunnel. It was dark on the top and bottom, but not solid. The sides were like tiles—some were red, yellow, and green, the others were black. All had a shine to them. . . . The feeling of the experience was very calming, relaxing, and tranquil.

Some described hearing a voice during the NDE or seeing a person who told them they couldn't go further and should go back. Others described a voluntary decision not to go through the tunnel. For many, the driving force that made them return was that they had to care for people who were dependent on them. This was a very beautiful and poignant feature that is

illustrated in the following case:

> . … in my 40s I had a serious car accident. … I regained consciousness as I was being put in the ambulance. … I then had a three-hour operation with three surgeons. … I appeared to be looking down on my body lying on the bed, with doctors and nurses on both sides of the bed attending to me. I was floating on clouds, pink-tinged, like looking out of an aircraft, with a tunnel of bright light, but although it was peaceful and pleasant, I remembered my children and panicked to get to them. … I then returned to my body and heard one of the nurses say, "That was a near thing."

Another person wrote:

> I felt myself [rise] above, hovering over the bed, up to the ceiling, looking down on myself in a blue light. I saw the doctors and nurses all around my bed, and there were quite a few of them. … I had no pain at all. To the right of the room up high I sensed a tunnel of light, but I didn't want to go through it, as I had just had my little girl and wanted to go back and look after her, and my husband and parents. I remember drifting back down into my body and back, oh, painfully back. . . .

Some had felt themselves being pulled into the tunnel but resisted it, as they felt it wasn't their turn yet. A traffic-accident victim wrote:

> I was given excellent treatment in the trauma unit. … In the early hours of the first or second morning they could not stabilize me. … I do not have any recollection of my condition or the events that happened in the hospital … but I do recall quite clearly an experience that is very hard to put into words. . . . I felt a gravity, a force pulling me into a blackness. I could not move and was totally fixed on the blackness that was pulling me in. It had a presence unlike anything else you can imagine, and I didn't want to go! With all my strength and will, I tried to turn away. I was shouting in my head over and over, "No, no, it's not my time!" It seemed to take forever, but eventually my head started to move away. The force was strong, and it took more effort than I can describe, but I did it and the more I turned away, the easier it became, until I felt a release from the pull. I then felt myself floating, and as I spun completely away from the force I saw the most gorgeous light I have ever seen. It was a huge orb of light and color, and it was the planet Earth. I was in space miles above, gazing down in amazement at the wisps of cloud and blue oceans. . . .

As well as the features of an NDE, this case also illustrates a very important point. After a significant insult to the brain, such as the kind that occurs with a head injury; a seizure; or a change in blood oxygen, carbon dioxide, or glucose levels, there's normally a period of memory loss before and after the insult. This lasts for a variable length of time, ranging from a few minutes to many days or weeks, and is due to an imbalance in the normal biology required for the brain to function. The extent of memory loss depends on the severity of the insult. In this case, as in many others, there was memory loss for the events that had occurred before and after the insult (a

head injury), as well as for those that had taken place during the illness. However, despite this, there was “complete” recall of the NDE.

For many people, the light at the end of the tunnel started out dim and then gradually increased in intensity. It was typically bright but did not hurt the eye. It was described as “warm” and “welcoming,” and it drew the individual to it. It often left them with a real sense of warmth and a feeling of being loved.

Those who encountered this light often described undergoing a powerful transformation and experiencing a dramatic change in their mind-set. Typically, people felt that they had become less materialistic, kinder to others, more of service, less afraid of death, and generally more pious and religious. In some cases, their family members had also noticed a change. Some people who had been atheists developed a very strong faith in God. The effect typically lasted for decades.

Some also encountered a “being of light,” either at the end of the tunnel or as they traveled through it. The being emanated love, compassion, and warmth and made the person feel very welcome and loved. It often played the role of an educator gently taking the person through a review of their life in which they could both see what they’d done and understand what mistakes they’d made. The aim seemed to be to educate and guide them, although they may have felt the pain and discomfort that they had caused others as a way of understanding why their actions had been wrong. The majority of those who’d had an NDE had no doubt that it was a vision of death and beyond.

Many also described how communication took place in a nonverbal manner, almost as if by telepathy.

As well as seeing a being of light, people described seeing deceased relatives during their NDE, usually parents, although in some cases it was another member of the family. Some people described seeing friends instead or even people they didn’t know. Sometimes the relative or other person welcomed them, and in many cases appeared to be expecting them, and at other times they told them to go back, as it wasn’t their time to die yet. A man wrote:

> In June 1996 my wife and I had been out for the day and got home about 5 p.m. I went upstairs to the toilet and coming out of the toilet, as I opened the door, I had a tremendous pain in my chest. … All I can recall now is the terrible pain I was in and a banging on my chest. This suddenly stopped—no more chest pain, no banging on my chest. I was floating on a big ball of white clouds

surrounded by beautiful golden scenery. The whole scene was extremely bright and clear, and suddenly my brother appeared with his usual smile, and I called to him, “Hi, Monty.” He had died six months earlier of a heart attack.

The following case is of a woman who described seeing a being of light and some of the deceased members of her family as well:

My own experience began after coming around from the operation, with tubes attached to me. … I became aware of the surgeon and anesthetist standing at the foot of my bed. The conversation went like this: Surgeon: “Well, we have done all we can. This little lady doesn’t know which way to go, so we will leave her alone and let her decide which way she’s going.” In the quiet and peace that followed, my spirit left my body, and I traveled down this tunnel leading toward a bright light at the end. It seemed to be a long way away. I couldn’t wait to get there. When I reached the end, Jesus stood there with his arms open wide and stopped me, then said, “Not this time. I have more work for you to do. You must go back.” At this point my husband and father (both had previously died) came toward me in the spirit and guided me back.

In the following case, a woman gave a detailed account of meeting a “perfect being,” who then guided her through her experience. When I interviewed her, she said that she found it difficult to convey the feelings of deep compassion, love, and kindness that had emanated from the being:

It all came to a head when I collapsed at home and crawled to a telephone. I had a friend who came to my aid, and I was eventually admitted to the hospital. … I had not had anything to drink for 48 hours, as any food increased the pain, so my medical condition was not very good. … My problem was that I was suffering with an ectopic pregnancy, the tube [fallopian] was rupturing, causing bleeding. … I suddenly found myself standing beside myself looking at a cord that connected me to my body and thinking how thin and wispy it was. Someone was beside me. I was made to feel secure and encouraged to trust my companion, who suggested that the cord was insignificant and that I should not concern myself with its fragility. I was guided toward the light. This was a sort of void, in which I found myself with the ability to fly, or should I say I had no weight—a very strange experience. Throughout the journey I kept looking back to ensure my companion was with me, but somehow toward the end of the journey I found myself just content to move on and reach the end.

Reaching the light, I was met by other beings of light and very gently encouraged to move on toward a life review. In this experience, my actions were not judged by others; I judged myself. My presence could see into my mind, and there was no way I could hide any thoughts. Gently I was encouraged to understand how my mistakes hurt others by experiencing what others had felt as a result of my actions. I was confused, as it all seemed so strange. The word *death* was never mentioned, yet somehow I came to understand that I was in that place of spirit where the newly dead move on to.

Many questions sprang to mind, like *How? Why?* I just had abdominal pain, nothing considered life-threatening. I was told by those in spirit that I had been pregnant. I did not know that I had been pregnant before this; I had just thought that I had abdominal pain. I was also told that the spirit of the child had initially consented to be born and then changed its mind … that it had experienced a very traumatic life before and just could not face life again just yet. Perhaps with

love and encouragement it would in the future. I asked to see this spirit and explain that with me and my husband, it would have known love. We had been hoping for another baby for some time. There was hesitancy, and after a delay one can only assume the spirit concerned was consulted. We spoke together. Poor soul, I really sensed the fear. It felt secure with the brothers around it, who supported it with love. … "One day" was the message from the brothers of light. "Be patient with him."

I was moved forward and eventually met the great God in many religions, a beautiful experience, and I can only say that I fully understand why St. Paul so wished to be with him, to be in the presence of such unconditional love, humor … understanding. … I did not need to speak—thoughts were sufficient. It was as if all were one and shared in his being; his radiance was everywhere. To this day, I still look back with elation at this experience.

I became very distressed and became very concerned at leaving a young 18-month-old baby behind. Who would care for her? My husband was away, no family close by. [God's] compassion was so strong, his love and caring so abundant that by his grace I was allowed to return. I was told that I would have a very special mission to do later in life, when my children grew up. He already knew there would be another.

I cannot remember much about the return. I recall being at the ceiling of the room and watching two nurses on either side of me, working on drips and drains. There was a jolt, and in no time I had drifted into what can only be described as sleep.

I had never read of near-death or out-of-body experiences, terms used today. … Two years later my son was born, very sickly, but to this day I have kept my promise given to him in that world of spirit—that I would love him unconditionally as long as he needed me. I created a home of love, and as a family we work together to love each other and the world—a small mirror of what I experienced in that land of light. After this experience, I have no fear of death and believe with certainty in the afterlife.

This was the most complete NDE that I'd come across. The most outstanding feature of this case was probably the woman's interaction with the being of light. When I met her, she told me that during the process of judgment, she felt uncomfortable and remorseful about the opportunities she'd failed to make use of in her life. She described these opportunities as the situations in which she could have been a source of goodness for others, but had neglected to be. She felt that her life had been an opportunity to develop further. The worst feeling was of having been given a wonderful opportunity and not using it. She told me that she now hated to do any harm to others, as she'd felt the pain that she'd caused others.

Although when I met her, many years had passed since her experience, it was still fresh in her memory and had had a very positive effect. She now felt that the most important thing in life was to take the opportunity to be of assistance to others, even if these were sometimes the more difficult options.

This response also highlights the positive transformation that many people undergo following an NDE, particularly those who've encountered a being of light.

A man wrote:

> It happened 17 years ago. I was knocked from my bicycle and shattered my skull into nine separate fragments and broke my right arm and my shoulder. I was not expected to live. … I knew there was going to be a tremendous impact a split second before the collision that threw me from my bicycle onto my head in the road. Then I remember nothing until, in the coma, I went where dead people go. I was standing next to a figure the same height as me. I was standing on his right, and he had his right arm across my shoulders. We were looking straight ahead of us into the near distance.
>
> I have since described this figure as a guide, because I found it so hard to say I met God. But it was God—"my" God. As I looked at him, he impressed on me that I was seeing the God I was brought up to envisage—he was manifesting in the way most comfortable and acceptable to me. I knew that the gray-haired, white-robed, nonsexual (by that I mean he was man and woman or neither) being beside me would be everything to all "dead people." We were standing on what looked like sun-kissed clouds or snow, which formed a vast circle. … "This is the love held for you by souls already," [he said] … and there appeared a cluster of spheres of light opposite. Human-sized, oval-shaped, and the most beautiful pink-golden hue that I can only describe as the color of beams of evening sun. . . .
>
> All dead loved ones were there, and the sphere at the forefront was bigger, as it was my grandparents, who were one. . . . The spheres were unrecognizable, as they were all the same, but I knew who was who. "God" told me to look down below … and way below us was Earth. "This is the love held for you by those on Earth," I was told. … Throughout my experience, I was told I wasn't to stay, and that I was being shown this to sustain me through my life, which has been very hard. I came back into my body through a tunnel. . . .

In their letters, many people described entering a very beautiful place in which they felt very happy, content, and peaceful, and which they often didn't want to leave. The descriptions of the place ranged from misty surroundings to a beautiful meadow, a garden, or grasslands. One woman wrote:

> I've suffered with asthma for many years, and have been hospitalized and had close calls several times, but this time was different. … I went through a tunnel. … When I came out of the tunnel, I was in a pearly, misty place. … It was then that I thought, *I've died.* But to make sure, I went back to my body. There was no heartbeat, no breath; I couldn't make it move or speak, so I concluded, "Yeah, definitely dead," and went back into the pearly place where I reminded myself there was nothing to fear.
>
> At that instant I was in a different level. Here all was soft gold, including me. … All of life's fears and worries seemed so unimportant, so absolutely nothing to worry about, and all our fearful fretting seemed so unnecessary. … I was aware that behind me stretched infinity, that all the people I'd ever known, knew now, and even would know were there, all made out of this golden

"light," all made of the same stuff, and so truly we are all one. I saw this like a liquid-golden ocean out of which each person rose, made of the ocean, in their own individual shape, but all one originally, basically. Many loved ones were there, and endless joy.

Another woman who found herself in a beautiful place wrote:

Early in August 1976, after having a hysterectomy … I started to hemorrhage badly. I was still unconscious at this point from the effects of the anesthetic, so I knew nothing of what happened until the next day. … I was told later that my heart had stopped before they could get me back down to the theater, and they had tried to resuscitate me. They had finally gotten me back into the theater and had to cut into my abdomen to see what had gone wrong—it was a vein that had been punctured during the first operation.

After becoming fully conscious, I started to remember what I first thought was a dream where I found myself whizzing through a dark tunnel at great speed, and I could see a blinding bright light at the end of it. When finally I came out of it, I found myself looking at a beautiful meadow. There was a young woman standing behind a traditional wooden five-barred gate. She was wearing a white dress and a circlet of fresh flowers on her head. She kept telling me that I had to go back, that it was too soon for me to be there and that there were things I had to do still in my life. I felt quite bereft at this, but at the back of my mind I remembered that I had three children, the youngest of whom was two years old, and a wonderful husband, and I knew I couldn't leave them at that point.

Then it was all over, and I don't remember how I got back into my body. The next thing I recalled was waking up, looking at the clock, which read five o'clock, and thinking, *Oh no, I haven't been to the theater yet, after having waited all afternoon.* … It was, of course, the following morning, which took a few minutes to register!

The lady that I remembered seeing was someone I knew as a young girl. She was a couple of years older than me and went to the same school, and we also went to the same riding stables. Maureen was always messing about with electrical things and was told many times by different people at the stables in my hearing that she would kill herself one day. Sadly it happened two years after she had her first child, a lovely little girl. I was on my way home one Saturday night and stopped to buy something from a local shop. Maureen was there with her daughter, and we chatted for a few minutes. I hadn't seen her for a few years then. Two weeks later, again a Saturday evening, I bought a local paper and on the front page was a picture of Maureen and the headlines that she had died trying to change a plug on a kettle.

This case also demonstrates that those who make a conscious decision to return often do so because of the need to care for others, particularly small children. Another interesting feature was that many people recalled reaching a symbolic point of no return, which they knew they should not go beyond. In this case, it was a wooden gate. Others recalled a stream, a river, or a doorway. A person who had suffered severe anaphylactic shock after an abdominal operation wrote:

I knew no more of the outside world until I came to—soaked in perspiration—to see the surgeon

and his registrar sitting at the foot of the bed doing something to my right ankle—a "cut down" to get fluid into my collapsed system. The surgeon was suturing the tube into place. He subsequently told me that he thought he had lost me, it was such a near-death situation.

The strange thing was that "inside myself" at the time . . . I was busy with my own experience, which was strange. I became very aware of my own existence. … I was then aware that I was very peaceful and calm and felt that I was "held" by a Loving Presence at a point in time which was critical. It can only be described as the "point of no return." I felt very happy and knew that if I went beyond this point there was something vital, ongoing, full of life beyond. It was like waiting for a door to open … . I felt entirely alive, alert, myself and happy—a deep, all-pervading sense of content—and "knew" that beyond that point was something wonderful. And that is all I remember because I came to in my hospital bed wondering why the surgeon was playing with my right foot when he'd operated on my abdomen!

All the accounts that people sent to me were truly enlightening. Here I have only been able to convey a fraction of them. They were really moving, and I felt very privileged to have had the opportunity to study them. I was also extremely touched by the wonderful generosity of all the people who so kindly shared their intimate secrets with me. It was astonishing to think that these accounts represented just a small selection of NDEs from people in the wider community.

Although I couldn't comment on the validity of people's claims, obviously the NDEs were very real to those who had experienced them. No two experiences were exactly the same, but at the very least the dying process really seemed to be a pleasant experience for the vast majority of people and seemed to unfold in a particular pattern.

Even though in many cases the critical event or illness that had led to the NDE had been unpleasant and painful, there appeared to be a point at which any pain or distress was replaced by peaceful, pleasant feelings. For many, this then led to the experience of seeing and going though a tunnel, typically very fast, toward a bright light at the end. Some people reported seeing the light at the beginning of the NDE, while others didn't see the tunnel at all. In many cases, people found it difficult to find words to adequately describe the beauty of the light and the sensations they felt upon seeing it. Those who did describe it typically called it a very "warm," "welcoming," and "glorious" light that didn't hurt their eyes, but instead drew them toward it.

Many also described the sensation of separating from their bodies and being able to "see" events from below while "floating" in an "out-of-body" state. This was described as being like removing a heavy garment of clothing or shedding a skin and moving away freely, leaving the old skin behind.

Interestingly, people consistently described the “self” as the part that was above, rather than the body that was lying below.

Throughout the experiences, people consistently described being able to think clearly and lucidly, with well-structured thought processes together with clear reasoning and memory formation. Essentially, during the NDE, people retained largely the same consciousness and personality as they had before it, although the experience did change them afterwards.

Some noted seeing other people, most commonly deceased relatives, friends, or even complete strangers. It was almost as if these people had come to greet them and to help them through their NDE. Sometimes they saw others as spheres of light, some more glorious than others. Many also felt that all were equal.

Some individuals said that they saw a “being of light” who was full of love, mercy, and compassion and in their eyes was “perfect.” This being sometimes played the role of a loving educator, who with kindness and compassion watched over the person and guided him or her through the experience and in some cases a review of their lives. The prevailing sense was one of all-pervading love and benevolence. The love that radiated from the being of light had a far deeper intensity than that which emanated from other people who were encountered during the experience. Some identified the being of light as “God,” while others described it as a religious figure such as Jesus, and others still simply thought of it as an unnamed “being of light.”

During the NDE, communication took place through “minds” rather than verbal speech. During their interactions with the being of light, some described undergoing a “review” of their lives. They sometimes found themselves seeing and experiencing all that they’d done and felt completely “transparent” with respect to their actions, words, and intentions. All that they’d thought, felt, or experienced was completely and clearly visible to them as well as to the being of light. Some also described being able to feel any pain and distress that they’d caused others during their lifetime. Therefore, they had come to a point where they didn’t want to harm others, whether by actions or words. They began to view life as an opportunity to be a source of goodness to others. After the NDE, they described a major transformation in their personalities. This was particularly the case for those who’d encountered the being of light. They described losing any fear of death

and becoming less materialistic and more altruistic. Many had engaged more in activities that would help others.

Finally, although having a religious theme, NDEs didn't seem to correlate directly with traditional religious views of the afterlife. A bright and warm welcoming light, a tunnel, and a being of light are not typical descriptions of the afterlife in most religions. Never–theless, there seemed to be an interesting point about the role of an individual's background in interpreting the NDE: People often seemed to interpret their NDE based on their own underlying thought processes. So, for example, a Christian who saw a being of light would identify it as Jesus, while someone of a different faith would describe it as being a religious figure related to their own faith, while others interpreted it as being God Himself, and others simply called it a "luminous being." Despite the different terminology, however, they appeared to be describing the same concept.

For a long while, the only people I came across who'd had an NDE were those who'd sent in their accounts. Now I needed to see what experiences people would have during the cardiacarrest study. This was the really important group that we needed to investigate. Sadly, though, most of those who'd had cardiac arrests were too ill to survive, and those who did had no memories from that period. I was beginning to get despondent, but I had no choice other than to be patient and persevere with my work.

❑❑❑❑❑

CHAPTER FOUR

THE SCIENTIFIC PARADOX

Whether I liked it or not, by this point I'd become well known as the doctor researching near-death experiences and the afterlife at Southampton General Hospital! I didn't particularly like the attention, nor did I like the fact that some people associated the study with the afterlife, but I had no say in the matter.

Although before starting the study I'd had reservations about the possible reaction of some of my medical colleagues, I soon came to realize that most people, including doctors, nurses, pharmacists, dietitians, physiotherapists, hospital volunteers, and administration staff, were actually very interested in my work. At the hospital, people often asked me how "the project" was progressing. That isn't to say that some weren't skeptical, but many of those who were, were still very curious.

As the study progressed, I was invited to give presentations on the subject, first at one of the medical educational meetings and then together with Dr. Fenwick at the weekly hospital seminars called the Grand Rounds. I felt very nervous about both of them, but they went very well, and we had lots of positive feedback. Later that year, I was also invited to join the Resuscitation Committee of the hospital, where I helped with training issues.

During that time, my friends and colleagues often used to tease me about the project by humming the theme from *The Twilight Zone* when I walked onto the wards! I used to just give them a quick nudge, or gently hit them, and then smile and get on with my work. As the study progressed, a cartoon appeared in a local newspaper, the *Daily Echo*, which really amused me, and it was nice to see that people outside the hospital were also seeing the lighthearted side of things.

"No, I don't want to come in - I'm just researching out-of-body experiences for Southampton General Hospital"

This cartoon is probably my favorite. It appeared in one of the local Southampton newspapers, *The Daily Echo*, after an interview about the study.

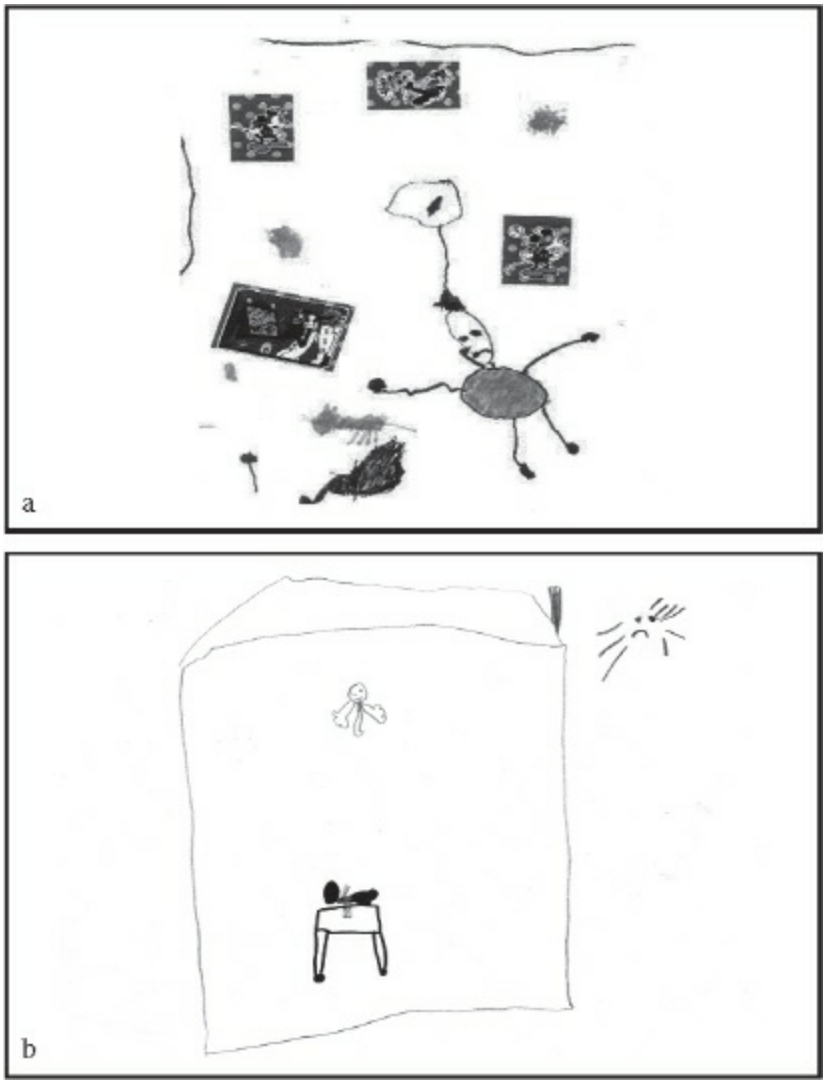
Although I could see the funny side, in general I didn't like the attention very much. I preferred to just concentrate on completing the study. Having said that, though, the increased awareness was positive in that it enabled me to receive the many fascinating NDE cases from the public that taught me so much more about the subject.

One of the last cases that I received was from a lady whose grandson had had an NDE. She wrote:

> John's heart had stopped. … There was a lot of commotion … they were pressing on his chest and he was lifeless and blue. . . . They put him in an ambulance and took him to hospital. . . [After he had been discharged from hospital] one day, during the course of play, he said, "Grandma, when I died, I saw a lady." He was not yet three years old. I asked my daughter if anyone had mentioned anything to John about him dying, and she said, "No, absolutely not." But over the course of the next few months, he continued to talk about his experience. It was all during the course of play and in a child's vocabulary.
>
> He said, "When I was in the doctor's car, the belt came undone, and I was looking down from above." He also said, "When you die, it is not the end … a lady came to take me. . . . There were also many others who were getting new clothes, but not me, because I wasn't really dead. I was going to come back."

Interestingly, John's parents noticed that he kept on drawing the same

picture over and over again. As he got older, it got more complex. When asked what the balloon was, he said, “When you die, you see a bright lamp and … are connected by a cord.”



These are two drawings by John (like all other people who’ve had NDEs, I’ve changed his name), who had the near-death experience when he was less than three years old. His family had at first been concerned because they saw that he kept on drawing the same theme. Here is a drawing from when he was younger (a), and one from when he’d grown a little older (b).

John’s case was truly fascinating and confirmed much of what I’d read regarding children’s NDEs.

Then a few years later, I received another account, which was equally captivating. The mother of the boy wrote:

My son Andrew, then three and a half years old, was admitted to hospital with a heart problem. … He had to undergo open heart surgery. . . .

About two weeks after the surgery, he started asking when he could go back to the beautiful sunny place with all the flowers and animals. I said, "We'll go to the park in a few days when you're feeling better." "No," he said, "I don't mean the park, I mean the sunny place I went to with the lady." I asked him, "What lady?" and he said, "The lady that floats." I told him I didn't know what he meant, and that I must have forgotten where this sunny place was, and he said, "You didn't take me there. The lady came and got me. She held my hand and we floated up. … You were outside when I was having my heart mended. … It was okay. The lady looked after me; the lady loves me. It wasn't scary; it was lovely. Everything was bright and colorful, [but] I wanted to come back to see you." I asked him, "When you came back, were you asleep or awake or dreaming?" and he said, "I was awake, but I was up on the ceiling, and when I looked down I was lying in a bed with my arms by my sides, and doctors were doing something to my chest. Everything was really bright, and I floated back down. …"

About a year after his operation, we were watching [the TV show] *Children's Hospital*, and a child was having heart surgery. Andrew got really excited and said, "I had that machine" [a bypass machine]. I said, "I don't think you did." He said, "Yes, I did, really." "But," I said, "you were asleep when you had your operation, so you wouldn't have seen any machines." He said, "I know I was asleep, but I could see it when I was looking down." I said, "If you were asleep, how could you be looking down?" He said, "You know, I told you, when I floated up with the lady. …"

[One day] I showed him a photo of my mum (she had passed away) when she was my age now, and he said, "That's her. That's the lady."

This is Andrew's drawing of his out-of-body experience. Here he's being taken by a lady he later recognized as his deceased grandmother. (Again, I've changed Andrew's name.)

These children's NDEs were fascinating. In both cases the children had experienced an out-of-body state, had drawn it later, and had described meeting a lady—in Andrew's case, his deceased grandmother—and seeing a bright light. The content of the NDEs seemed to be simpler, and the children were more limited in their ability to explain all that they'd experienced, but nevertheless they seemed to have had the same core experience as adults. Children like John and Andrew surely could not have known much about the concept of death and the afterlife and hence could not have had preconceived ideas about it, yet nevertheless they recalled similar features to adults.

Obviously most of the cases that I received came from the U.K. and other Western countries, but I knew that NDEs had been reported in other countries and cultures, too, and in the years that followed I managed to interview a few people from other cultures. A middle-aged Muslim woman told me:

> I had been admitted to hospital for a major operation. . . . During the procedure, I found myself at the corner of the room looking down at my body and realized that I had died. … I could see outside the operating room, and the doctors were telling my family that I had died. I felt very frustrated, as I felt comfortable [up] at the ceiling and wanted to tell them I was fine. There was complete peace. There was a bright, warm light everywhere. I was really distraught by the fact that my family was so upset and they were all crying. It was very frustrating … then the next thing I knew, I was in pain and back in my body.

Interestingly, when I spoke with this woman's son, he confirmed that the

family had all been told that she'd died.

I've since received a few other NDE cases from non-Western people, and they do indeed seem to share the same core features, although to be sure of this I would really like to have performed a large study myself.

As my colleagues became more aware of my interest in the study of the human mind at the end of life, some of them started telling me more about their own experiences. One day I was on call with Dr. Richard Mansfield, an experienced cardiologist who was very meticulous and serious at work. I respected him very much. That evening we'd taken a break for coffee and started talking about my study. Suddenly he told me the following:

> I don't know much about these experiences, but I can tell you something that happened to me that really freaked me out. I still cannot explain how it happened. . . .
>
> One night when I was on call, there was a cardiac-arrest call and together with the rest of the team, I ran to the arrest. The patient was a 32-year-old man. On my arrival, he had no pulse, wasn't breathing, and was in asystole [a flatline].[1] We continued to resuscitate him, even though the outcome looked bleak. We had intubated him and he was receiving oxygen, as well as having regular three-minute cycles of chest compressions and adrenaline. He had also had atropine, but despite this he remained in asystole and did not have a pulse. We carried on for over half an hour, but then started to lose all hope as he had remained pulseless and in asystole throughout this time. Because he was young we decided to carry on, but eventually it became obvious that we were not winning and so as team leader I made the decision to stop. I checked with everyone else on the team and we all decided that it was time. Before stopping, I once more checked that the monitor and the connections were working appropriately and that the patient had no pulse. We then stopped and accepted that he was unfortunately dead. We were all very sad, as he was so young.
>
> I left the patient in the room with the nurses who were preparing him for his family's arrival. I went outside and sat down by the nurses' station and started writing in the medical records. As I was writing, I realized I couldn't remember exactly how many vials of adrenaline we had given him, so about 15 minutes later I went back into the room to check. While I was there, I looked across at the patient and noticed that he wasn't quite as blue as when I had left him. He looked pinker, which was very strange. I looked at him again. He definitely looked pinker. Rather hesitantly I moved over and checked his groin for a pulse. I couldn't believe it! Now he had a pulse! I couldn't understand how, but he definitely had a pulse. So we had to restart resuscitation and call the rest of the cardiac-arrest team back. We eventually managed to stabilize him and then transferred him to the intensive care unit.

A week or so later, he came back to the ward. To my amazement, not only had he recovered fully, but he hadn't suffered any brain damage. After the arrest, everyone was sure that he would have had brain damage because not only had he been through a prolonged resuscitation while he was in asystole, but also he had been left for 15 minutes afterward

without any kind of CPR [massaging of the heart] or oxygen.

> When I saw him later, he told me that he had watched everything from above and described all that had happened in detail. He told me everything that I had said and done, such as checking the pulse, deciding to stop resuscitation, going out of the room, coming back later, looking across at him, going over and rechecking his pulse, and then restarting the resuscitation. He got all the details right, which was impossible because not only had he been in asystole and had no pulse throughout the arrest, but he wasn't even being resuscitated for about 15 minutes afterward. What he told me really freaked me out, and to this day I haven't told anyone because I just can't explain it. … I also know that I definitely checked the monitor, the leads, the gain [this is a technical means of checking that the flatline is truly flat], and the connections as well as the pulse before stopping. I just can't explain it, and I don't think about it anymore.

I was absolutely stunned by this story—first, because I really knew and trusted Richard—not only was he a highly competent cardiologist, but also a very good doctor all around. If I'd heard this story from anybody else, I probably wouldn't have believed it. Second, I knew that he had no interest in NDEs whatsoever. Third, I knew what happened in a cardiac arrest, so I appreciated why he'd been so shocked.

As doctors, we generally try to limit the duration of a cardiac arrest, because at best we can only achieve around 30 percent of the circulation despite all efforts. The longer this process goes on without the heart starting, the more the brain is starved of oxygen and glucose because of the relatively inadequate circulation. Therefore, there's always a great risk of permanent brain damage with resuscitation, which increases as it becomes prolonged. We often face a dilemma: Do we try and restart the heart at any cost and then have a patient who's left with permanent brain damage, or do we stop? It's a very difficult decision to make sometimes. For this man not to have developed brain damage and then to have come back and recalled all the details of his resuscitation went against everything that we would have expected medically.

Soon afterward I came across another very interesting case recalled by a doctor working with acutely ill patients. One evening I'd been invited to a dinner party where I met Joan La Rovere, an American doctor who'd been working in London at Great Ormond Street Children's Hospital. She had trained in pediatrics at Harvard Medical School and then moved to the U.K. to further her experience at this very prestigious children's hospital. She was now working in the intensive care unit. After dinner the conversation turned to my study, and surprisingly, she started telling me about a child whom she

had cared for a few years earlier:

> At that time I was part of a team that would go to smaller peripheral hospitals and collect sick children who needed to be at Great Ormond Street Hospital for specialist treatment. One evening I had gone with the rest of the team to a hospital in Kent, about 20 miles away from London, to collect a nine-yearold child with severe kidney failure. She was very ill and needed urgent transfer to our hospital to be managed on our paediatric intensive care unit.
>
> During the ambulance journey we got stuck in the rush-hour traffic, and even though we were going as fast as we could with the emergency lights and sirens blazing, we could not travel fast enough. The girl's condition deteriorated, and suddenly her heart stopped beating and she had a cardiac arrest. We started resuscitating her straightaway in the ambulance, but the traffic really wasn't helping. We tried over and over again and just couldn't start her heart again.
>
> Eventually one of the nurses said, "Look, she's dead—why don't we drive off the main road and go to a local hospital and have her pronounced dead?"
>
> Something in me said we should carry on, even though it looked as though we really had lost her. I said, "No, we will carry on with the resuscitation. If she's going to be pronounced dead, it will be at Great Ormond Street and nowhere else." So we carried on with the resuscitation. I didn't have much hope, but something told me to start talking to her during the resuscitation. I don't know why, but I did it, even though it made no sense to me really. Nevertheless, I kept comforting her and telling her not to worry and that she was going to be okay.
>
> Miraculously, we got her heart restarted almost as we arrived at Great Ormond Street. Although she was still in a very critical and unstable condition, I was pleased because we'd managed to restart her heart, and at least we had gotten her to Great Ormond Street.
>
> At that time, my job was to collect patients from other hospitals, so I never looked after her while she was in the hospital, but I heard from the nurses that she gradually improved and eventually was discharged home.
>
> One day, many months later, she came back to the hospital to see everybody who had cared for her. During her visit, she asked one of the nurses, "Where is the American doctor who looked after me in the ambulance and who was talking to me during the trip?" She had watched everything from above and had recalled all the details. I was amazed when I heard this, as she'd never even seen me throughout the trip. She had been too ill and had been on a life-support machine. . . .

Now my search for answers was getting even more interesting. It was incredible that so many highly respected doctors working with acutely ill patients had had their own experiences with NDEs. There really was something amazing going on. … How could people recall details so clearly when essentially they'd gone through clinical death for 30 to 45 minutes? This was a real quandary that couldn't be accounted for easily with our current scientific concepts. I couldn't even say that maybe the doctors had been wrong, because they were all very experienced and competent and very familiar with cardiac-arrest resuscitation. Like Professor Chamberlain,

Richard Mansfield, and Joan La Rovere, I couldn't explain what had happened at all. I turned my attention back to our study and hoped this would reveal the answers.

❑❑❑

At that time I used to finish work around 6 p.m. My routine was then to visit the wards and follow up on any cardiac-arrest patients. One day on my way home, I stopped by ward D2E, the acute-admissions ward, on a routine follow-up of a cardiac arrest call and approached one of the nurses to find out if the patient had survived.

"The gentleman in bed six had a cardiac arrest two nights ago and survived," she said. "I think he's by his bed now."

I walked into the bay and followed the bed numbers with my eyes. "Ah, number six." I glanced down to find a stocky, middleaged man sitting up in bed. As I approached him, he looked up at me and shuffled himself up the mattress.

Pointing to my name badge, I introduced myself: "I'm Dr. Parnia. I normally work on the medical unit of the hospital, although I have to tell you that I'm not one of the doctors looking after you this time. I'm here because I'm conducting a study into the experiences people have when they're in a deep coma. I understand that you suffered a cardiac arrest a few days ago, and I wanted to find out if you'd be willing to participate in a study."

He looked at me in a bemused fashion, and then said, "Yes."

As was routine, I explained the study in more detail and then got him to sign a consent form to participate in it.

"Thank you for signing the consent form. Now I really want to ask if you have any memories of the period when you were in a coma."

To my surprise, for the first time I didn't get the "Of course not, I was in a coma" look. This time the patient looked at me in a slightly guarded fashion but didn't say anything. I sensed hesitation, so I carried on talking. . . .

"It's for a scientific study—you see, some people have reported having an experience when they've been in a coma, and we're very interested in finding out more about what they experience. Do you have any memories from the period when you were in cardiac arrest a few days ago?"

"Yes," he said.

I was really taken aback by this reply! I almost had to pinch myself. I'd waited months for this.

"What did you experience?" I asked eagerly.

Rather hesitantly, he started to speak. "I saw a tunnel at the corner of the room, with a bright light all over. … I felt very peaceful and calm. … During this I saw my mother who had passed away."

All this time he was looking at me as if to say, "Well, can I trust you?"

"Is there anything else, perhaps?" I said.

"No, that's it. I don't remember anything else."

"You didn't have any other sensations or memories?"

"No."

He obviously hadn't had an out-of-body experience, otherwise he would have told me, I thought. I didn't ask him about it anymore, as I didn't want to put words in his mouth. Even so, at last we had our first NDE case! It wasn't the breakthrough I'd hoped for, but it was something. In fact, it had a relatively low score of 8 on the Greyson Scale. More important, the patient hadn't claimed to have detached from the body or watched events from the ceiling, so we couldn't ask him anything about the boards.

In the next few months, we collected three other cases that didn't quite fit our Greyson criteria for an NDE. Two of these were experiences that simply didn't score highly enough on the Greyson Scale (as they didn't include at least four NDE features), and one was completely different from an NDE. This last person described a totally bizarre experience in which he'd seen some people jumping off a mountain. The other two described near-death-like experiences—one had experienced seeing a light and feeling peaceful, and the other had felt peaceful and seen a tunnel—but they scored less than 7 on the Greyson Scale, which wasn't enough to classify them as NDEs.

However, during this time we also collected three cases of people whose experiences did score high enough to be classified as NDEs. The first two had the same familiar theme of feeling peaceful and seeing deceased relatives, a bright light, and a tunnel. The final case was that of a woman who was really hesitant to talk to us. All the others had also been hesitant initially, but she was really quite concerned about what people, in particular, her husband, would think if they knew about her experience. Although obviously all the cases were anonymous and we were going to keep them confidential, she made us promise that nobody else would find out about it. Eventually,

after a few days, she decided she could tell us what she'd experienced:

> I don't know what happened, but I just felt at peace and in the distance in the corner of the room I saw a frame—it looked like a doorframe—and my father, who died many years ago, was standing there. I felt bemused at what was happening and started to go toward him. He then looked at me and put his hand out, as if to say "Stop." He told me I had to go back. I felt that if I went beyond that frame, I could not come back again … . I don't recall anything else about the experience.

We now had four people who'd described having an NDE during cardiac arrest, although none of them had described an out-of-body experience, so none of the boards that we had so painstakingly mounted on the ceiling and that I'd changed and cleaned so regularly had been tested.

We had planned to keep this study a small pilot and, if successful, to use it as a means to expand to a large multi-center study across the country. So, at the end of the one-year period, we decided to stop and analyze the data we'd already obtained before moving on to the larger study.

Analyzing the Results

This had been a fairly small one-year prospective study of cardiac-arrest survivors carried out on the emergency, medical, and coronary care units of our hospital to analyze what people experience when they reach the point of death. It had also been the first-ever study that had aimed to investigate all three theories put forward for the causation of near-death experiences. It had primarily been designed with the intention of developing an appropriate method to study near-death experiences during cardiac arrest. The fact that we had people describing NDE during cardiac arrest was very significant.

Before we'd started the study, I had read in the medical literature that NDEs might occur in as many as 30 percent of cardiac-arrest survivors. Now this sort of figure seemed to be a gross overestimate. It was becoming very clear that although NDEs did occur in cardiac-arrest survivors, the frequency of the experience, and that of out-of-body experiences, was far lower than people had estimated.

Over the next six months, I analyzed the data from our study by dividing the cases into two groups based upon whether or not people had had an NDE. All the survivors who hadn't had an NDE were placed into the first or control group, and all those who *had* had an NDE were placed into the second or

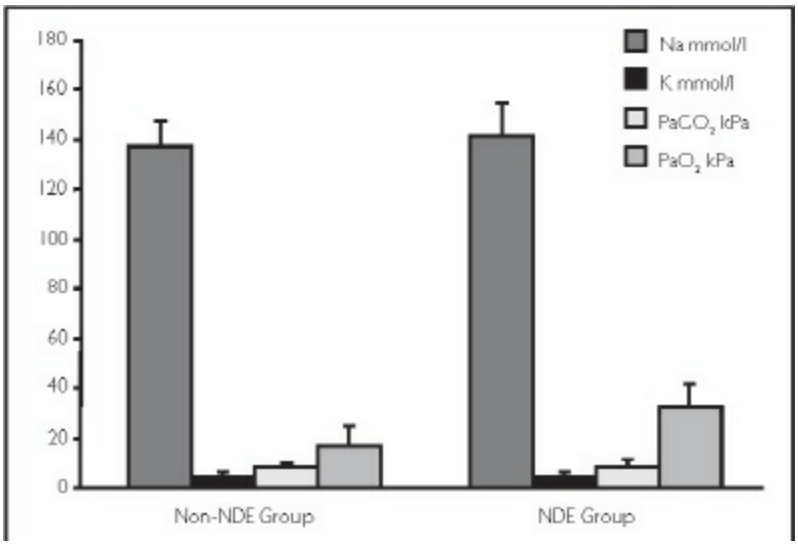
study group. The plan was to compare the two groups for differences that might have contributed to the causation of the experience.

I first analyzed all the data regarding the brain-based theories by comparing the average oxygen, carbon dioxide, sodium, and potassium levels (see Table 1), as well the drugs that had been administered during cardiac arrest. There was no evidence to support the role of drugs; lack of oxygen; or excess carbon dioxide, potassium, or sodium in causing NDEs. Interestingly, if anything the oxygen levels were higher in patients with NDEs than those without, but we had to be very careful in interpreting this, as we had a very small sample of people with NDEs compared to those without. We really needed larger numbers, but although small, our sample didn't seem to support the concept that NDEs were being caused by a lack of oxygen to the brain.

We then compared the religious backgrounds of those with NDEs and analyzed whether these had contributed in any way to the experience. All four people who'd had an NDE were nonpracticing Christians—one had become a practicing pagan ten years earlier—but there were no features specific to Christianity in the experiences, and they all followed the core experiences as described by Dr. Moody. There was also no obvious difference between the experience of the person who was a pagan and the others.

We'd been unable to test the transcendental theories, as no one had claimed to have been out of body.

The actual frequency of an NDE was around 6 percent (4 out of 63) of cardiac-arrest survivors if we didn't include the 2 people who had had NDE-like features but scored too low on the Greyson Scale, and around 10 percent (6 out of 63) if we did include them.



These results looking at sodium (Na), potassium (K), carbon dioxide (CO_2) and oxygen (O2) were obtained from our pilot study. The only difference between the NDE and the control group was that the average oxygen levels were higher in the NDE group, but as there were only four patients in this group, it was not possible to be sure whether this was a real finding. For this, a larger sample would be needed.

This study had been effective as a pilot in telling us how frequently NDE occurred and had also provided some data on the potential roles of brain-based and psychological theories regarding the causation of NDE, but it had been too small to answer all the questions that we'd set out to address.

The study had also raised a very important question: How could people with cardiac arrest have lucid, well-structured thought processes with reasoning and memory? This seemed like a real scientific paradox. I realized that I needed to study what happened to the brain during cardiac arrest in more detail.

What Happens to the Brain During Cardiac Arrest?

I became more and more interested in understanding how the body actually responded to the shock of the heart stopping. After all, dying is a continuous biological process that is initially reversible, but with time becomes completely irreversible. This is why we as doctors quickly try to intervene

and reverse the process through various resuscitation methods. Therefore, any experience that people have during a cardiac arrest and hence during the dying process must be studied in the context of the biological changes that are taking place inside the body at that time.

The instinct to stay alive is universal. It is, in fact, one of the most elementary instincts that all creatures have, from the smallest ant to the largest elephant. Most living beings also have a language through which they communicate. Cells in the body are no exception to this. The difference between human language and that of cells is that rather than using sound, cells release different chemicals. So, just as we may shout or scream when under stress, cells will respond to stressful events by releasing particular chemicals. It is by coming to know these chemicals that we can learn the language of the different cells in the body and hence study them as well as the illnesses that arise from them.

For the brain, the effect of the heart stopping, thereby stopping the flow of blood to the rest of the body, is utterly catastrophic. Having studied the processes that take place in the brain and being familiar with how cells respond, I could see that for brain cells, the loss of blood flow would be comparable to a massive disaster suddenly striking a large city made up of millions of inhabitants that until a few moments earlier had all been working harmoniously together.

I thought of the panic that would strike the people living in the city. At that point everything would become a matter of survival. Perhaps brain cells also try to survive, to preserve the life of the brain.

Brain cells are completely dependent for their survival on the flow of oxygen and nutrients via the bloodstream. When this stops, they start to suffer almost immediately. Brain oxygen stores and consciousness are lost within 20 seconds, after which glucose and high-energy stores are also lost. So, within a few seconds of the heart stopping, the brain cells turn to special stored-energy sources, called ATP, to keep themselves alive. However, due to a very high need for energy, these stores are used up very quickly, typically within about five minutes, and then the brain cells are left without any source of energy and begin to starve. Unlike humans, who in a disaster may live for days without food, brain cells need food almost immediately.

The shock of a lack of oxygen to the brain, which typically takes only 10 to 20 seconds, causes the brain cells to release a particular chemical

transmitter called glutamate, which normally has the function of stimulating other brain cells. There is, therefore, a mass release of this chemical across the brain by the cells, which become “overexcited” as a result. This becomes harmful to the cells and is actually called “excitotoxicity.” This is because the mass release of glutamate causes the cells to swell up excessively, thus causing the membrane that holds their structure together to become damaged and the contents of the cells to leak out. At the same time, the membrane holding the cells together also becomes damaged through another mechanism, as the lack of oxygen causes it to be broken down into tiny fat molecules.

However, despite all these efforts, the brain cells gradually become irreversibly damaged and eventually die. Research by doctors has shown that brain cells start to become damaged within minutes of a loss of blood flow and that if normal blood flow is not restored within about 15 to 20 minutes, brain-cell loss becomes quite extensive. During this whole period, the cells “scream” by releasing certain chemicals, and attempt to activate certain genes before losing function completely.

Numerous studies have demonstrated that immediately after cardiac arrest, blood pressure drops to unrecordable levels—in most studies less than 15 mmHg, a level not compatible with life.[2] The body has special internal blood-pressure receptors, and as soon as it recognizes that there’s a loss of blood pressure and blood flow, it tries to raise the blood pressure and blood flow to the brain by releasing several hormones, such as epinephrine, into the bloodstream. These are the same hormones that are released during a critical illness, but as cardiac arrest is the most critical of all illnesses, the levels of these hormones are correspondingly much higher at that time.

A cardiac arrest is in fact associated with the highest epinephrine levels ever recorded—1,000 times higher than the amounts normally found in the bloodstream. As well as epinephrine, the hormones released include norepinephrine and vasopressin. All of these are extremely potent as far as increasing blood pressure, so potent in fact that they’ve been developed for medical purposes and are now given to patients who have very low blood pressure or have had a cardiac arrest. These hormones cause the blood vessels in the body to tighten up and then squeeze blood up toward the brain. They also act on the heart and try to stimulate it into action, but unless the heart

beats, they have almost no effect.

In addition to these hormones, many others are released, such as prolactin, endorphins, the body's own morphine-like substance, and b-lipotropin, all of which have the function of ameliorating the adverse effects of a lack of blood pressure.

Despite all these efforts by the body itself, however, once the heart stops, breathing stops, and within a few seconds brain cells become damaged, stop functioning together, and eventually die, unless doctors start to interfere with this process and attempt to restart the heart.

What Happens During Medical Resuscitation?

Although modern heart and lung resuscitation, which is now commonly known as cardiopulmonary resuscitation, or CPR, was established in the 1950s and 1960s, historically various other methods had been used to try and bring someone back to life. Early resuscitation attempts involved heating the body, using warm ash and hot water, whipping, blowing hot smoke in the mouth and rectum, and rolling people back and forth on a wine barrel or a horse to help the chest expand and take air in.

Since the 1960s, resuscitation methods have continued to develop through international collaboration and research, but the basic techniques have remained the same and involve compressions of the chest wall to help push blood around the body, and also the placing of a tube in the windpipe to allow oxygen to be delivered to the lungs. Unfortunately, though, cardiac arrest still carries a very high rate of death.

Studies have shown that chest compressions are not capable of producing adequate blood flow to the brain, due to a combination of inadequate blood pressure being generated and an increase in the pressure inside the brain itself, which means that even higher blood pressure is needed to push blood up into the brain. It has also been shown that due to various physiological processes that take place during cardiac arrest, blood flow to the brain remains quite low even if the actual measured blood pressure generated during compression seems reasonable.

During conventional CPR, without the use of stimulating drugs such as epinephrine, brain blood flow has been found to be less than 5 percent of

normal values. The addition of drugs such as epinephrine can in some circumstances increase brain blood flow to 30 percent of normal levels. However, I realized that even with resuscitation, there was still significantly reduced blood flow to the brain, to levels that were not compatible with brain-cell electrical activity.

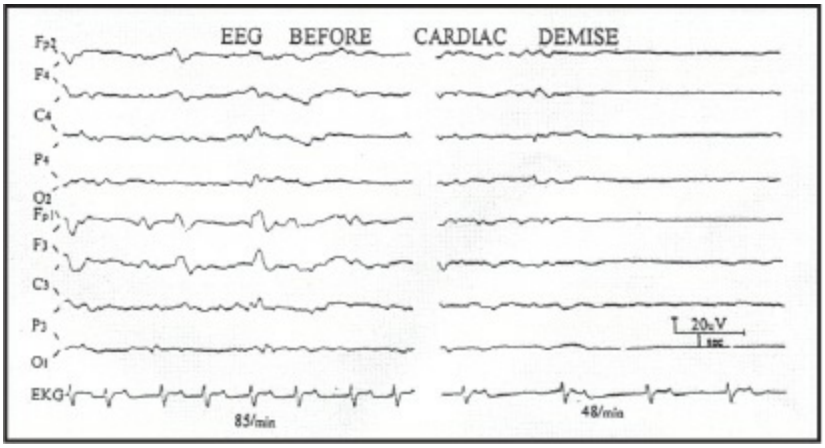
Research had shown that after resuscitation had been commenced, the mean arterial pressure had risen marginally to approximately 30–40 mmHg, but had still remained well below the levels needed to adequately enable blood to flow to the brain. In fact, the blood pressure had only returned to a level high enough to allow adequate blood flow to the brain after the heart had finally been restarted. I recalled that while I'd been training, we'd been taught that during resuscitation, at best we could only restore 30 percent of the output of the heart. Now I could see why—we couldn't raise the blood pressure to a high enough level. Obviously, the inadequate blood flow was also the reason why there was always a concern that there could be brain damage during cardiac arrest.

In some studies, brain function had also been monitored using an electroencephalogram (EEG) (see the figure on page 92). This is a device that measures electrical activity arising from the surface sections of the brain (cortex) where higher brain functions, such as sound, vision, sensory input, thought processes, and memory are mediated. In the first few seconds after the heart had stopped and the blood pressure had dropped, the EEG waves changed to an initial slow phase and then quickly to a "flatline." This "flattening" of the EEG waves indicated a lack of measurable electrical activity in the brain. This took on average ten seconds to develop from the time the heart had stopped. The EEG remained flat during the entire cardiac-arrest resuscitation, which corresponded to the period of inadequate blood pressure, and so, inadequate blood flow to the brain that had been recorded in the other studies. It was only after the heartbeat had been restored that the EEG began to show some activity.

If there was a delay in starting the resuscitation, the brain waves not only remained flat during the resuscitation, but also for almost two hours after the heart had been restarted. This is because the brain cells had been starved of oxygen and in response had released many chemicals that had had the effect of constricting or narrowing the blood vessels that carried blood to the brain. Therefore, it had taken a few hours for the vessels to open up sufficiently to

allow blood to flow and to lead to electrical activity in the brain.

The EEG measured activity on the surface of the brain, but other studies had demonstrated that when the surface area of the brain (cortex) stopped functioning, as measured with the EEG, there was also no activity in the deeper structures, including the brain stem, the area at the base of the brain that keeps us alive.



The EEG is a means of measuring the electrical activity taking place in the brain, and in particular, the cortex of the brain. Many studies have shown that during a cardiac arrest when there is severe reduction in blood flow to the brain, the EEG waves go flat and remain flat throughout. This may actually happen even before someone's heart has completely stopped. It is an indicator of a lack of adequate blood flow. In the case shown here, the patient's heart stopped, but the EEG actually went flat (arrow) when the blood pressure dropped to around 40 mmHg and the heart was still beating at 48/min. From then on, it remained flat throughout the cardiac arrest.

THE PARADOX

I started thinking about the implications of this. *There is something that just doesn't fit here,* I thought. *Here we have a group of people who are so severely ill that they've reached the clinical point of death, yet somehow they report having lucid, well-structured thought processes, together with reasoning and memory formation from that time. There are also reliable anecdotes of patients who have recalled detailed events that have taken place during resuscitation. How can this happen? How can there be such clear and lucid thought processes when the brain is at best severely disrupted, and as far as we can measure, not functioning?*

That was particularly intriguing. Normally people who are very ill develop an acute confusional state, which is characterized by confused and disordered thought processes together with memory loss. That's understandable, because when the delicate balance of nutrients, hormones, and other essential substances around the brain becomes disrupted, then of course it cannot work properly. The vast majority of people from our study had complete memory loss for the period of cardiac arrest, which is what I would have expected, but 6 to 10 percent paradoxically seemed to have thought processes and consciousness—in other words, an NDE. Even though they also lost memory of the events surrounding their illness, they remembered the NDE very clearly.

There were four possible explanations. The first was that maybe the experiences hadn't taken place during the cardiac arrest, even though people genuinely believed they had. Memory is fallible, so perhaps they had taken place during a very short period of time either before or after the brain had stopped functioning.

However, although this was certainly a possibility, it couldn't apply to the cases where people had recalled watching events that had occurred in the middle of the cardiac arrest and had been verified by medical and nursing staff. For this to have happened, there must have been consciousness present at a time when all the scientific studies had demonstrated, at best, a severely disordered brain, and at worst, no brain function at all.

Also, it didn't entirely fit with our current knowledge of how the brain responds to a severe insult such as a head injury or a severe lack of oxygen. Any kind of insult to the brain leads to a period of memory loss just before and after the event. In fact, memory is a very sensitive indicator of brain injury, and the length of memory loss is a good way of determining the severity of the injury. Events that occur just prior to loss of consciousness wouldn't be expected to be recalled, and recovery following a cerebral insult is confusional—just like the man who'd written to me about his NDE after an accident and had said, "I do not have any recollection of my condition or the events that happened in the hospital … but I do recall quite clearly an experience that is very hard to put into words. …" It just didn't make sense for people to remember the NDE so clearly and nothing else.

The second possibility was that perhaps our measurement of brain function wasn't sensitive enough. Maybe there was activity in the brain during a

cardiac arrest, but we just couldn't measure it using an EEG. As time goes on, however, and we develop more accurate means of measuring the function of the body, perhaps we'll be able to gain a clearer picture.

This still didn't seem to be adequate, however. Thought processes are mediated by multiple areas of the brain. So even if there was some minute activity in the individual cells that we couldn't measure, this would still be unlikely to lead to adequate electricity being generated for the brain cells to communicate with each other.

Another possibility was that perhaps consciousness and thought processes were not mediated by brain-cell electrical activity after all. Perhaps a different mechanism was involved. Although this seemed counterintuitive at the time, I later found out that some scientists had begun to explore the possibility of subatomic quantum processes mediating consciousness.

The fourth possibility that had to be considered was whether consciousness functioned even when the brain did not. This idea was of course not compatible with mainstream scientific views regarding the relationship between the mind and the brain, but objectively speaking, it had to be examined, as we simply didn't know what type of matter mind and consciousness were, how they came to exist, and what their relationship was with the brain.

Our study had been too small, and obviously much more research was needed to understand exactly what was happening, but nevertheless we'd answered some questions, and another interesting question had now been raised. Together we finalized the text, and the paper was accepted for publication in the medical journal *Resuscitation.*

At this time we also started to prepare for a much larger study that we hoped would provide definitive data regarding the outcome of the human mind at the end of life. We would use the experiences gained from our pilot study to examine the occur-rence of NDEs in more than 1,000 cardiacarrest survivors.

Other NDE Studies

One day out of the blue I received an e-mail from Dr. Pim Van Lommel, a cardiologist from Holland. I didn't know him, but he said that he'd also

performed a study of NDEs in cardiac arrest, and he very kindly sent me a copy of his research.

I got very excited. This had been a much larger study than ours. The aim had been to investigate the occurrence of NDEs in cardiac-arrest patients, and also the factors that affected the frequency, depth, and content of the experience. The researchers had followed 344 cardiac-arrest survivors from ten hospitals over a two-year period, and 41 survivors, or 12 percent, had reported a core NDE. The researchers had found that the occurrence of NDEs wasn't associated with the duration of cardiac arrest, unconsciousness, medication, or fear of death. Patients had then been followed for a further eight years and had been found to have undergone a transformational change in personality. Those who'd had an NDE showed a significant difference in their social and religious attitudes as well as their attitudes toward death. They had more involvement in the family, empathy and understanding of others, less fear of death, and a more spiritual outlook on life.

This study confirmed that NDEs lead to a transformational change that is greater than the result of simply coming close to death. The authors of the Dutch study also concluded that since all cardiac-arrest survivors underwent the same biological changes and were given the same drugs during cardiac arrest, NDEs were unlikely to occur as a consequence of these factors, since if they were, then most people with cardiac arrest would have an NDE.

A very interesting finding was that during the study, approximately 24 percent of those who had an NDE also had an out-ofbody experience. In one case, a nurse had reported that during a cardiac arrest she had removed the patient's dentures and placed them in a drawer in a special trolley. The resuscitation had been protracted and had gone on for one and a half hours. Throughout that time, the man had remained in a coma. Afterward he'd been transferred to the intensive care unit.

One week later he'd returned to the same ward where the nurse worked. He had apparently seen her and said, "Oh, that nurse knows where my dentures are." He had then gone on to say, "Yes, you were there when I was brought into the hospital, and you took my dentures out of my mouth and put them into that car [meaning the crash trolley]. It had all these bottles on it, and there was this sliding drawer underneath, and that's where you put my teeth."

The nurse had said:

> I was especially amazed because I remembered this happening while the man was in a deep coma and in the process of CPR. When asked further, it appeared that he had seen himself lying in bed and that he had perceived from above how the nurses and doctors had been busy with CPR. He had also been able to describe correctly and in detail the small room in which he had been resuscitated, as well as the appearance of those present. … At the time … he had been very much afraid that we would have to stop CPR and that he would die. And it is true that we had been very negative about his prognosis due to his very poor medical condition when admitted.

In the following year, a third study of NDEs in cardiac arrest was completed in the U.S. by Professor Bruce Greyson. He had followed up 1,595 people who had been admitted to the hospital with heart disease over 30 months. Of these, 7 percent, or approximately 110 people, had had a cardiac arrest, and 10 percent of those had had an NDE. Those who'd had an NDE weren't different from those who had not in terms of social or demographic variables, cognitive function, or degree of heart disease. This study had not directly tested the mechanism of causation of NDE.

Soon afterward, a fourth study investigating NDEs in cardiac arrest was completed by Janet Schwaninger, a cardiac nurse who'd worked in the U.S.. In this study, 23 percent of cardiac-arrest survivors had an NDE, and six months later they'd been transformed in a positive manner.

These other three studies were very informative, as they confirmed that NDEs occurred in 10 to 23 percent of cardiac-arrest survivors. They also confirmed that the experience had a transformational effect, and that out-of-body experiences had been reported. Unfortunately, none of the researchers had directly tested the theories for the causation of NDEs or the validity of the out-of-body claims.

The authors of these other studies had, however, raised questions regarding the mechanism of causation of NDEs in cardiac arrest. Professor Greyson had concluded by saying: "The paradoxical occurrence of heightened awareness and logical thought processes, without subsequent amnesia, during a period of impaired cerebral perfusion [blood flow to brain] raises particularly perplexing questions for our current understanding of consciousness and its relation to brain function."

It was very interesting that we now had four independent studies of NDEs in cardiac arrest, and all four had raised the same questions regarding the mechanism of causation of NDEs and the relationship between the mind and the brain. How could thought processes, memory formation, and reasoning be occurring at a time when there was little or no brain function?

These studies further reinforced our commitment to set up the largest-ever study of NDEs during cardiac arrest. Perhaps the answers were within reach now. In the meantime, maybe we needed to reevaluate our views about the relationship between the mind and the brain, the possible nature of consciousness, and even the nature of reality itself.

❑❑❑❑❑❑

1There are generally three types of cardiac arrest: one in which the heart has a relatively normal electrical activity but still doesn't beat; one in which there is very abnormal electrical activity, which is what stops the heart from beating; and one in which there is no electrical activity at all. This is commonly called a flatline, or in medical terms, an asystole. This is the worst type, and only a very small percentage of those who have this type of cardiac arrest survive. Shock treatment is only useful for those whose hearts have an abnormal rhythm, and is not used in asystole.

2Blood pressure is vital for life. In order for the body's vital organs such as the kidneys and the brain to receive nutrients, "pressure" is needed to push blood into these organs and allow the nutrients to get into them. If the pressure drops below a certain level, then the organs don't receive the nutrients. Although there is some variation, normal blood pressure is around 120/80 mmHg. The higher value (systolic) is the pressure immediately after the heart contracts. The lower value (diastolic) is the value after the heart relaxes. If the higher value is less than 80–90 mmHg, this is very worrying. It often takes place in patients who are in clinical shock. Sometimes the mean arterial pressure (MAP), a figure in between the higher and lower values, is used. Under normal circumstances this is around 80–100 mmHg. Doctors will often become concerned if the MAP is less than about 60–70 mmHg, as levels below this may hinder blood flow to the vital organs, including the brain. Obviously, if the blood flow to the vital organs drops sufficiently, then the organs stop functioning. For the brain, the first signs are confusion and drowsiness, followed eventually by coma.

CHAPTER FIVE

UNDERSTANDING THE MIND, THE BRAIN, AND CONSCIOUSNESS

Most people look at the brain in awe, and rightly so. Just the sight of it is immensely awe-inspiring. I remember the first time I saw someone's brain during an operation to remove a blood clot. I was working on the neurosurgical unit at Southampton Gen-eral, and we'd admitted a lady named Sheila to the ward. Sheila was in her late 50s and had been admitted to the hospital with a stroke following internal bleeding. She needed an urgent operation in the middle of the night, as the clot was pressing against the brain, causing damage to that area. I was assisting the neurosurgeon, Dr. Carter. During the operation he removed a small area covering the brain, and behind the clot I saw a pinkish-gray organ pulsating with every heartbeat. It was a phenomenal feeling.

I'd seen many operations before, but there was something really special about watching the brain. Its beating created an almost hypnotic state in me. I felt a sense of seduction, fascination, and awe. I wondered whether it was this feeling that had captured the hearts and minds of people like Dr. Carter and had driven them to become neurosurgeons. As I watched this small gray organ pulsating in front of me, I thought to myself, *Here lies Sheila—her memories, feelings, emotions, love for her husband and children, her free will, her conscience, her sense of right and wrong, her intuition … all that is Sheila is lying in front of me in this pulsating organ, isn't it?*

Inadvertently, that night I had entered into a fascinating debate on perhaps the greatest mystery facing science today: the nature of consciousness and the mind. The basic scientific problem was simple to describe but difficult to answer: How did Sheila's unique awareness, thoughts, feelings, and emotions

arise from her brain? Traditionally in philosophical circles this has been referred to as “the mind-body problem,” and although it has been a focus of philosophical debate for millennia, scientists have only really become interested in it in recent times.

As I stood there watching the surgeon performing the operation on Sheila’s brain, I thought for a moment about the problem of consciousness. How could the little gray cells that made up the brain I was watching also produce thoughts and feelings? How did they give rise to the unique, subjective inner world that we all experience during our daily lives?

I started a mental tour of the brain and its component parts. Like many other complex structures in the body, I knew that the brain was made up of a number of different parts, all connected in a way that allowed it to perform its overall function.

The brain has two mirror-image halves, called the cerebral hemispheres, which, according to one brain scientist, Professor Ramachandran, resemble a “walnut sitting on top of a stalk, called the brain stem.” Each half of the mirror-imaged brain, or hemisphere, is divided into four areas that have different functions: the frontal, parietal, occipital, and temporal lobes, which make up the surface structure of the brain called the cortex. There are also some areas that lie between the stalk and the cortex, including the areas responsible for the initiation and modulation of movement, temperature regulation, and goal-directed behavior such as eating, drinking, and reproduction, together with the expression of emotions. These sections are also connected via tracts of nerves to the rest of the brain and the rest of the body.

During the surgery, I was watching the area called the cerebral cortex, the structure on the surface of the brain that’s involved with higher brain function, including thought processes, listening, seeing, counting, drawing, recalling memories, and moving particular muscles such as the arms and legs. I knew that the frontal areas were concerned with some very mysterious aspects of the human mind and human behavior such as moral sense, wisdom, ambition, and other activities of the mind about which we know very little. Damage to the frontal section of this part of the brain typically causes changes in personality and problems with the sensation of touch, as well as with speaking, whereas damage a little farther behind, in the parietal area, can cause problems with speech as well as the use of the arms and legs.

These areas are also concerned with creating a three-dimensional representation of the spatial layout of the external world, and of our own body within that three-dimensional representation.

Farther back is the occipital area, which is involved with vision (and damage to which can result in blindness), and to the side is the temporal region, which is involved with certain aspects of memory, hearing, emotions, and visual perception.

Underneath the cortex or main surface structure of the brain, which mediates all higher brain functions, is the stem, otherwise known as the brain stem. It maintains all of life's vital processes, including heartbeat and breathing, as well as important reflexes such as the pupillary reflex, which controls the size of our pupils in response to light; and the gag reflex, which prevents food and other swallowed objects from going down the windpipe. The other important function of the brain stem is maintaining wakefulness. So damage to the brain stem may lead to unconsciousness, loss of vital reflexes, and eventually death.

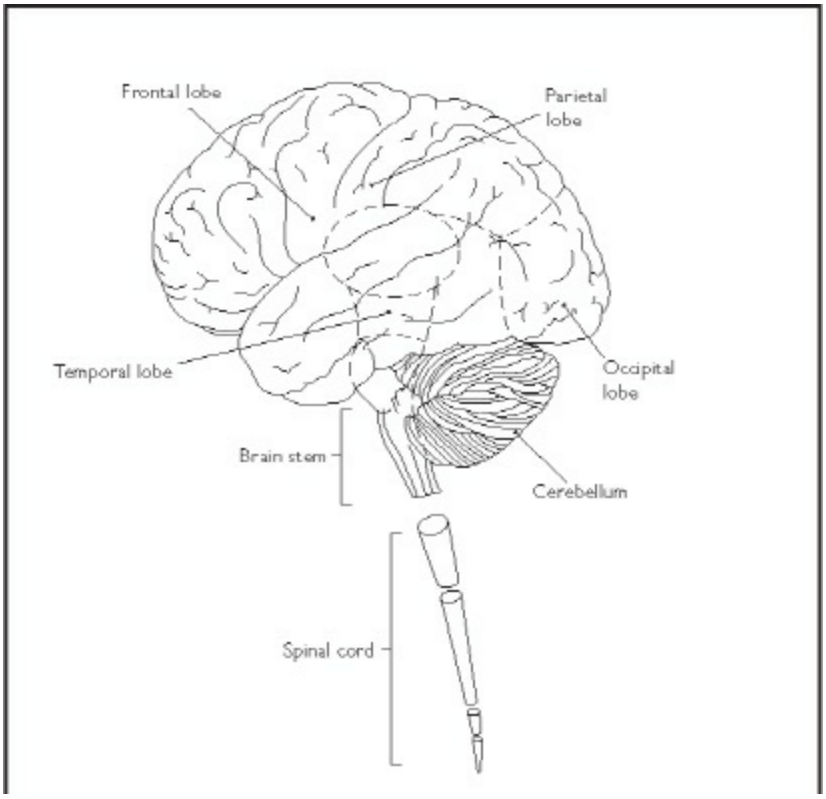
Due to its position, the brain stem is also very much like a highway junction through which all the connections between the body and brain pass. For example, all the nerves carrying sensations from the rest of the body converge in the spinal cord before traveling up through the brain stem and then branching off to the different sections of the brain, including the cerebral cortex, where the higher functions are carried out. Messages are then relayed back to the body from the cerebral cortex via the brain stem.

Behind and just above the brain stem lies the area of the brain that's responsible for the regulation and coordination of our movements such as walking and running. This is the third main structure in the brain and is called the cerebellum (see figure of brain).

Sheila had developed a blood clot that was pressing against the middle, or parietal, area of the surface of her brain, so she had developed weakness of her arms and legs. The aim of the surgery was to relieve this pressure and restore power to these extremities. In Sheila's case, we also had to operate to remove the blood clot, because sometimes a large blood clot above the brain surface can push down so much against the brain that it can compress the brain stem, cause damage, and may even be fatal.

Looking at Sheila's brain, I remembered how the different areas were in a constant state of communication through electricity carried by long tracts of

nerves. Although I couldn't see it, I knew that there were continuous flashes of electricity going right along the brain as well as coming up from the deeper structures to the surface, and vice versa. If any area of the brain became damaged, this would affect the normal patterns of electricity, which is why an EEG monitor, which measures electricity, can be used to diagnose brain diseases.



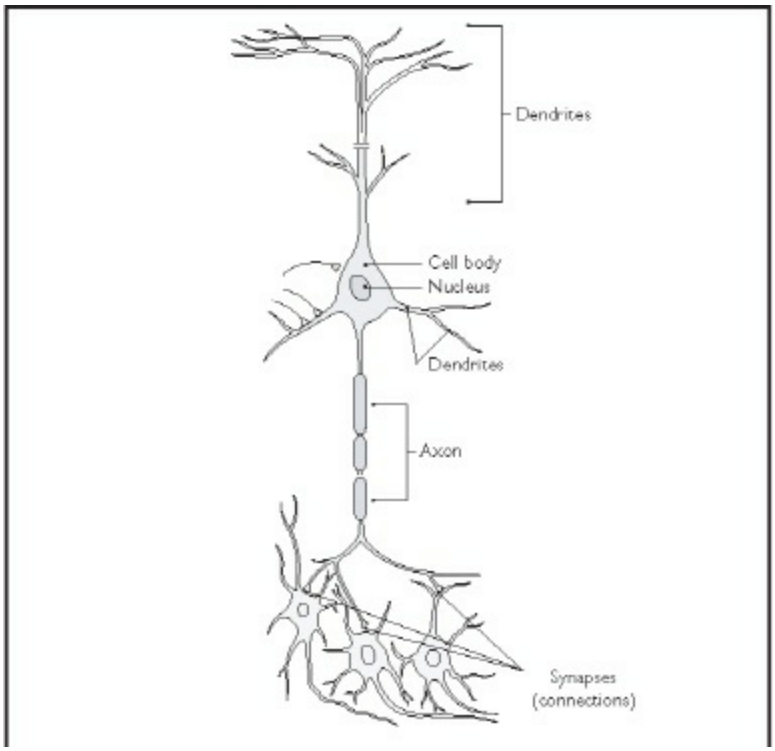
This diagram illustrates some of the different sections of the brain. The larger white structure, like a walnut, is composed of the different sections relating to higher brain functions. Impulses from the five senses arrive through the nerves at the spinal cord or the section above it, the brain stem, and then travel up to the cortex. Messages are then sent back to the rest of the body from the cortex and other sections of the brain via the brain stem and the spinal cord. The budlike structure with more black-and-white lines is the cerebellum, and is responsible for balance.

The source of the electricity flowing across the brain was specialized brain cells called neurons. I knew that the brain was thought to be made up of 100

billion of these neurons and that they formed the basic structure and functional units of the nervous system. Each neuron is connected to other brain cells through 1,000 to 10,000 contacts called synapses. It is here that exchange of information takes place between brain cells. This is incredible—with around 100 billion cells, each with 1,000 to 10,000 connections to other cells, the total number of permutations and combinations of brain connections and hence activity is almost infinite!

All the different brain states, including emotions such as love, hate, and anger, as well as our thoughts, ambitions, and even religious sentiments, are mediated by these connections or synapses, which have themselves been shown to vary and become more complex if a certain area of the brain is being used and developed. In fact, it's thought that no two people, even twins, will have exactly the same brain connections or wiring, since these synapses or connections develop and change constantly according to different stimulation of the brain areas during our lifetime. This is because as we grow, learn, and generate new experiences, the connections in our brains become more extensive. These ultimately depend, then, on the richness of experiences.

The neurons themselves are constantly generating electricity through the passage of positively and negatively charged chemical elements, such as sodium, in and out of the cells via special gates on the surface of the cells. The electricity then flows along the entire length of a cell until it reaches another brain cell. At that point, it causes a special chemical, called a neurotransmitter, to be released from the first cell onto the next, where it causes gates on the surface of the second cell to open, which again generates the electricity along the length of that cell by allowing positive and negative elements to go in and out of it. Sometimes when these neurotransmitters are released, they have the effect of stopping the electricity from going along any farther at the next junction, and at other times they may cause further action at the next nerve junction. This is how they stop a signal or send it on.



When we look at the brain, it's composed of different brain cells. The one involved with sending electrical impulses is the neuron. Here it can be seen how one neuron connects with many other cells. Each neuron is like many other cells and is composed of a "body" within which lies the "nucleus." This contains all the genes and codes for the production of many proteinlike chemicals that mediate the effects of the cells. These include chemicals such as neurotransmitters. The cell also has many arms with fingers at the end (dendrites) that stretch out and connect with similar arms coming off other brain cells, thus forming a network of cells. Each cell also has a long arm that sends a signal along, called an axon.

Each network of cells, which may be made up of many millions of cells, mediates a specific function or different functions of the brain, such as the conscious sensation of "seeing." Each of the connections, which is similar to two people holding hands, is called a synapse. A synapse is like a railway junction through which an arriving impulse, just like an arriving train, is either sent on its way or stopped. This depends on the chemical (neurotransmitter) that is released. Some are inhibitory

(like a red light), while others are excitatory (like a green light). It is at the level of the synapses in the brain that some scientists, such as Professor Susan Greenfield, have proposed that "consciousness" may arise.

Like almost all other cells in the body, neurons also produce proteins and protein-derived chemicals in response to a special code. This code is essentially in the form of genes that are in the nucleus, or control room, of each cell. The chemical products sometimes have the function of maintaining the structure of the cells themselves, and at other times may be released from the cells to have an effect on neighboring cells.

As well as neurons, there are also other cells, called *glial cells*, in the brain which do not produce electricity but just act as support for the electricity-producing neurons. Their name comes from the Greek for "glue," because when looked at through a microscope, some of these cells appear to be attached to the neurons like glue. They're like scaffolding maintaining the structure of the brain, while the wire-like neurons transmit the messages.

The brain is thus a highly complex and well-organized mesh of electrical wires that form a network of electrical superhighways conducting information to and from the most distant parts of the body. So in the brain it's not an individual cell that performs a particular function, rather a large group of cells all connected together, otherwise known as a *neural network.* It is, therefore, the overall activity of multiple areas of the brain that is involved with all the functions of the brain, including conscious experiences such as thoughts, vision, and hearing.

THOUGHTS AND THE BRAIN

Science has largely come to grips with the mechanisms that lead to various signals and messages being transmitted in the brain and the connections between the brain and the rest of the body. But where in the midst of all this electrical activity and chemical processes do thoughts lie? How does the passage of electricity across a cell lead to feelings? When I take a bite from an apple, scientifically we can track all the pathways from my tongue to the cortex of the brain that mediates this taste, but how do these chemical and

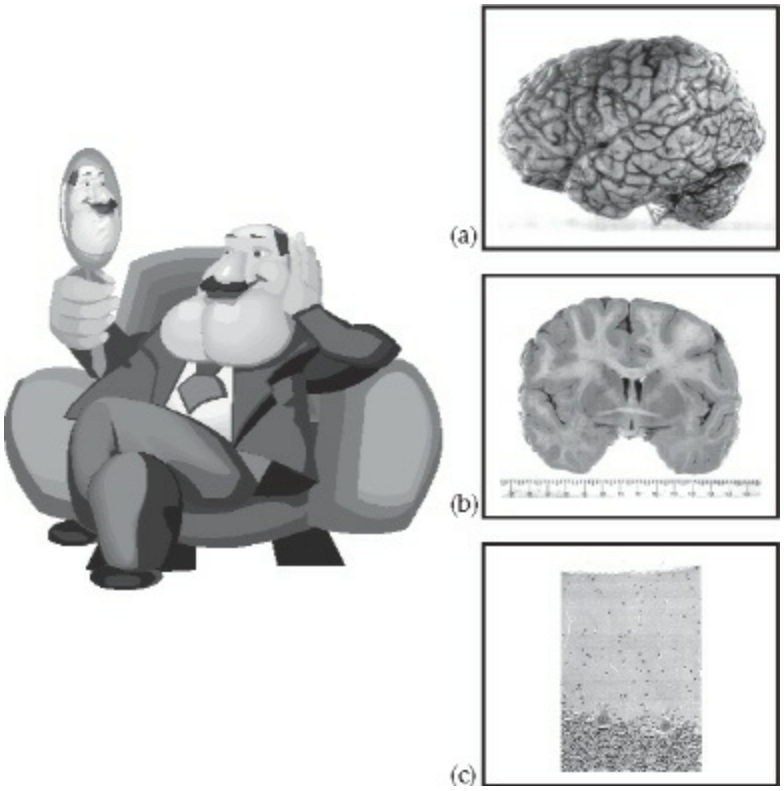
electrical processes turn into sweet and sour?

This is the problem that has baffled philosophers, psychologists, and scientists throughout the ages. David Chalmers, an Australian philosopher, has summarized it very well: “Consciousness poses the most baffling problems in the science of the mind. There is nothing that we know more intimately than conscious experience, but there is nothing that is harder to explain.” In his books he has called this the “hard problem” of consciousness. This is in contrast to the “easy problems,” which essentially involve understanding the mechanisms that allow the brain to deal with the various sets of information that it receives. These are the processes that we’ve largely discovered.

Modern medicine has helped answer some of the questions regarding the relationship between thoughts and the brain—namely, the specific areas that are involved with certain feelings, emotions, and thoughts, but not the question of how thoughts are actually produced from brain cells.

Modern methods of analyzing thought processes now involve special brain scanners called functional MRI (magnetic resonance imaging) and PET (positron emission tomography) scanners. These work upon the principle that brain cells have a constant need for blood, which carries with it all the vital nutritional substances that they need to work, including oxygen and glucose. So the scanners essentially detect and follow the movement of blood to various parts of the brain. In this way they can tell us which part of the brain is working more actively at any time.

I thought of how farmers in dry areas of the world such as Egypt form canals to carry water from a main river to the areas of land that they’re cultivating. In the brain, there’s a very similar system in operation. Instead of a single river such as the Nile, there are two main vessels that carry blood to the brain. Then there are smaller vessels that act as canals carrying blood to other areas. Sometimes farmers around the Nile increase the flow of water through a particular canal to cultivate a specific area of land. Then they may change the flow so that more water gets to another area. Now if, using satellite technology, I could observe the changes in the flow of water through the canals from space, I would be able to tell which parts of the land were being worked on at any one time simply by observing the changes in the flow of water in that region. In a similar way, brain scanners detect changes in the flow of blood to various regions of the brain.



(c) Even though we've come to understand the structure of the brain and the cells that make it up, the biggest question in science today is, how does electricity traveling down the arms of the cells and across the junctions lead to the amazing phenomena of thoughts, conscious feelings, emotions, and sensations? When this man looks at himself in the mirror and admires himself, how do these thoughts and feelings arise?

This problem is better understood when we examine a real brain (a). Here we see the surface or cortex; then, looking at it through a section (b), we see the tracts running up to the cortex. These are made up of millions of the axons, or arms, arising from millions of neurons all bundled together to form the tracts of nerves that we can see. In another section (c), we see a cell body itself with the many projections or arms around it.

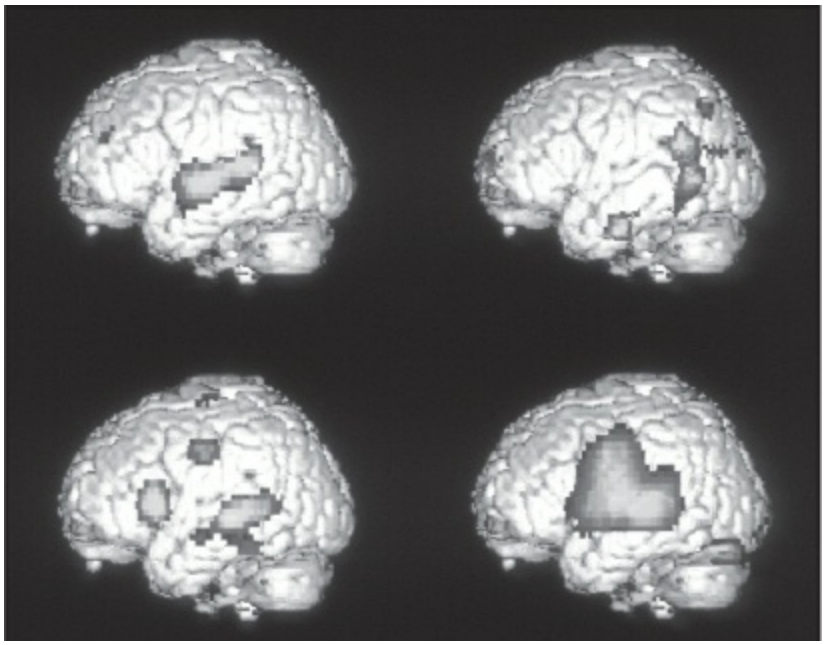
The big question is, how do thoughts arise from this cell? If I were to look at this cell and someone were to tell me it was thinking I feel guilty, or hungry, I would probably think that

person was a little bit mad. Yet if a single cell can't think, how can many of these single cells attached together through electricity and chemicals produce thoughts? If I throw a brick at my neighbor's window, should these cells feel "guilty"? How does free will arise from these cells, or is everything just predetermined?

In addition to detecting changes in blood flow, specialized scanners can also detect the areas of the brain that have increased their consumption of oxygen and glucose. So by following the changes in flow of blood and the consumption of oxygen and glucose (metabolism) to various parts of the brain, scientists can understand which areas of the brain are involved with certain thought processes. This is called "mapping" the brain. To do this, scientists will place someone into a scanner and scan the brain while they're having certain thoughts.

As I read what I've written, changes are constantly taking place in the flow of blood to certain parts of my brain. I'm also enjoying music, and this pleasant feeling is accompanied by a reciprocal change in the pattern of blood flow to the part of my brain involved with this sensation. If I really get into my music and stop paying attention to the screen, the areas that had been receiving more blood while I was reading will now receive less blood, but other areas will then start to receive more blood. Interestingly, brain scans have shown that for any thought, many areas of the brain become active, and that it is therefore multiple areas of the brain that mediate thought processes. This is a very important point.

However, identifying blood-flow changes or increased metabolism of certain parts of the brain during an experience doesn't answer the big problem, which is: how does a physical collection of cells give rise to conscious experience?



PET scan showing brain activity while speaking/listening. Here, we can see how different groups of cells may become active with a specific conscious process. This doesn't, however, mean that the cells are producing thoughts or feelings, it just tells us that there's increased blood flow and glucose uptake into them.

(*Source:* Wellcome Department of Cognitive Neurology/ Science Photo Library)

Common Theories about Consciousness

In the months after the conclusion of our study, I started examining the literature to study the views of scientists on the problem of consciousness and the mind. I knew that the answer to the significance of our study and the other studies of near-death experiences in cardiac arrest lay in understanding the nature of consciousness.

While many well-known philosophers such as Plato and Descartes had argued that the mind and the brain were separate entities, many but by no means all modern scientists had proposed that the mind and consciousness were somehow products of brain activity. Unfortunately, however, despite obvious interest in this area, nobody had yet been able to propose a plausible

biological mechanism to account for how the brain might give rise to the mind or consciousness.

The problem was that no one even seemed to know how to start thinking about it scientifically. There was no obviously conceivable way that consciousness could arise from the currently understood mechanisms in the brain. This had led many scientists to believe that this mystery might never be solved by science.

One method of studying this area that had been introduced by scientists in the last 15 to 20 years had been to determine the brain-based changes that take place under certain conditions and to correlate them with conscious experience. In other words, scientists had attempted to study the biological processes that take place in the brain when someone has a conscious experience, such as seeing an object or thinking. These had been called “the neural correlates of consciousness” (NCC).

When studying these, many scientists had pointed out that it was important to remember that just because something correlated with something else, it didn’t necessarily mean that it caused it. This is a basic law of studying correlations in any field of science. When any correlation is observed between two events, there are three possible explanations. Let’s take the example of two actions, A and B. If there’s a correlation, then either A is causing B or B is causing A, or some other process is causing both of them. So when correlations are found between brain-based events and conscious experiences, all of the possibilities must be considered. We know that brain-based events correlate with thoughts, but no one has been able to demonstrate whether A causes B or B causes A or both. In other words, perhaps the brain-based events cause conscious experience, or maybe conscious experience causes the brain-based changes, or perhaps something else causes both of them.

Looking through the medical and scientific literature, I found that although many views had been expressed regarding the nature of consciousness, they could essentially be divided into two groups. The first was made up of conventional brain-based theories that suggested that mind and consciousness were produced from the brain. The second was comprised of theories that were considered to be “nonconventional” and looked beyond currently understood brain processes. Although the more common scientific view had been the former, both groups included theories from leading international

academics and Nobel Prize winners.

Conventional Brain-Based Theories of Consciousness

The most commonly held view in the scientific literature was that mind and consciousness were by-products of brain activity, just as, for example, light arises from the action of electricity passing through a lightbulb, or heat arises from the burning of coal. Hence, they were not the same as the underlying processes that take place in the brain, in the same way that light coming off a lightbulb is not the same as the activities that are taking place in the lightbulb.

Although, as mentioned above, experimental evidence demonstrating how this can happen is still lacking, nevertheless a number of different theories have been proposed to account for it. These theories have attempted to tackle different aspects of the problem of consciousness, such as how conscious experience may arise from brain cells, or how the different aspects of consciousness may bind together to form a single unified sense.

This is a particularly interesting and mind-boggling problem. As I sit here writing this book and drinking coffee, I'm receiving numerous inputs into my brain at the same time. On the one hand, I'm seeing light coming off the computer screen while I watch my hands typing away; and on the other hand, I can taste the bittersweet taste of coffee. In the background, I can see my green-colored robe, the window with railings outside, the table, and the many other objects scattered nearby. I'm also listening to the radio, to a song by Leann Rimes, while feeling the weight of my body against the chair.

All that I'm experiencing at this moment is part of one conscious state, yet all these different aspects of consciousness are actually mediated by many different areas of the brain. I know that vision itself is divided up into color, motion, and form processing, and mediated by 30 or so areas of the brain. Therefore, when I take a simple example of conscious experience, such as what I'm experiencing right now, and ponder all that's happening, each aspect is probably being mediated by hundreds of areas of the brain simultaneously, yet remarkably I experience it all as "one" and not hundreds

of different and separate consciousnesses. This is what neuroscientists call "the binding problem."

Several views have been proposed to account for how conscious experience may arise, and how the binding of consciousness into "one" may occur. It has been suggested that:

1. Mental states arise from specific patterns of activity within networks of brain cell connections.
2. Synchronized and rhythmic electrical activity in networks of brain cells leads to conscious awareness and the binding of conscious experience.
3. Consciousness emerges as a novel property of computational complexity among brain cells. It has further been argued that brain cells and their chemical connections are the fundamental units of information in the brain, and that conscious experience emerges when a critical level of complexity is reached in the brain's neuronal networks (the networks of brain cells).

The Role of Neuronal Connections

A noted scientist with an interest in the problem of consciousness is Professor Susan Greenfield of the University of Oxford. She has proposed that the mind may arise from the activity of brain cells at the level where the cells are connected together (the synapse). Rather than arising from a single isolated region of the brain, she suggests that consciousness arises diffusely from the brain-cell connections.

The reasoning, Greenfield argues, is that there is no single complete function that takes place in one region of the brain. As mentioned above, it is known, for example, that vision is divided up into many separate components that are connected together to give rise to the conscious experience of seeing, such as color, motion, and form processing, and the function of vision can preoccupy over 30 brain regions. Similarly, any one brain region can participate in more than one function. So brain regions are smaller parts of a wider brain stage and not units that work alone. Thus we know that conscious experience arises from the actions of many different parts at the same time.

However, when we break each area of the brain down into its smaller constituents, we see that each area is a complex circuit that is ultimately

reduced down to the connections between the cells, or synapses, or in other words, to the individual wires of the circuits themselves across which electrical signals are passed. This signaling is dependent on a series of different biological products, or proteins, which are themselves products of genes. Therefore, Professor Greenfield has proposed that the neuronal correlate, and in effect, the physical substrate of the "mind" is a process that occurs at the level of the brain connections, or synapses, which are not only highly dynamic, but which also reflect experience through their strength and extension of connections.

She hasn't been able to propose how actions at the level of the brain-cell connections lead to conscious experience. Nevertheless, she also proposes that it is this process, whereby connections so exquisitely mirror what happens to us, which leads to the "mind."

According to this theory, consciousness, or our sense of selfawareness, is thought to arise from the interaction of assemblies of neurons involving up to tens of millions of neurons all connected together. It is proposed that at any one time, there may be many neuronal assemblies present; however, the largest assembly will dominate and determine that moment of consciousness.

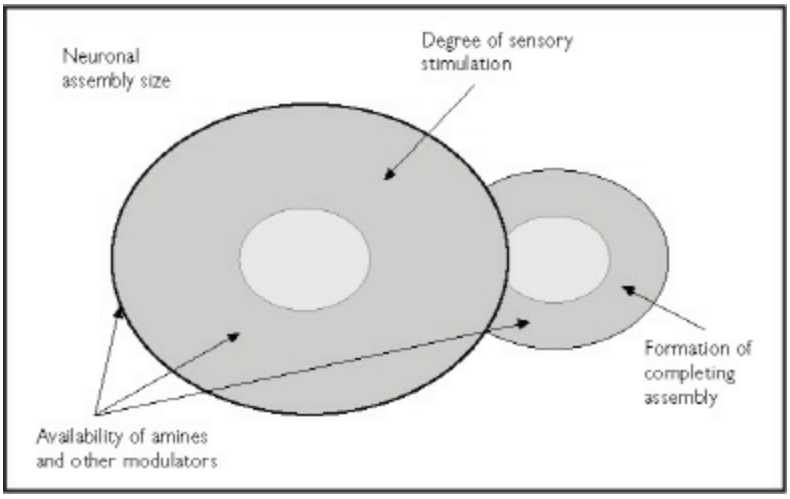
The degree to which cells are recruited, and hence the degree of consciousness, will be determined by a variety of factors, such as the strength of the input coming into the brain—for example, from the eyes and the fingers, as well as preexisting connections and the degree of competition, as shown by the smaller assemblies starting to form.

So let's imagine that we're standing on the street holding something in one hand. An assembly of brain cells related to "touch" is active, so we're aware of what we're holding. Then, suddenly, we see something that interests us—for example, an accident. We then stop feeling what we're holding and just experience what we're seeing. At that time, the activity of the assembly of brain cells related to touch would be overtaken by the new assembly of cells, which would have become active in relation to what we have seen.

The activity of these cells is in turn determined by the activity of various proteins, which may change in response to other signals, including events that take place in our body, such as hormone changes, immune changes, or changes in the levels of the neurotransmitters. So in the same scenario, if we had the flu and were feeling very ill, certain chemicals and hormones would be released by our body and immune cells that would also interact with the

brain cell networks, so we would feel “unwell” while seeing the interesting event.

❑❑❑


Neuronal assembly size
Degree of sensory stimulation
Formation of completing assembly
Availability of amines and other modulators

This diagram from one of Professor Greenfield’s articles on consciousness describes her view that there are always different networks of cells, as depicted using the circles. At any one time, one network or assembly of cells is more strongly activated, then with the arrival of another stimulus, another network may become stronger and take over. The amines are various chemical triggers that the cells release when activated.

Here, the larger circle shows a larger network of active brain cells. The smaller circle shows another active network of cells, but only the stronger (larger) one comes in our conscious experience, even though there may be many other networks active at any one time.

(Source: Modified from Greenfield, S, Mind, brain and consciousness, *Br J Psychiatry* 2002; 181:91–3; reproduced by kind permission of The Royal College of Psychiatrists.)

It has thus been suggested that the subtlest influences either from outside or inside the body modulate consciousness at the level of cell synapses in the brain, and hence lead to differences in consciousness, and that there’s always a competitive process going on between different assemblies of cells.

Synchronized and Rhythmic Electrical Activity in Networks of Brain Cells

This theory predominately aims to describe the intermediary pathway that may lead to the unified sense of self.

The late Francis Crick, a Nobel Prize winner and the codiscoverer of DNA, and Christof Koch of the California Institute of Technology, have proposed that a starting point for the study of consciousness is the study of the correlates of visual consciousness, in other words the changes in brain-based biological processes when we're conscious of seeing things. Crick and Koch have argued that all the different aspects of consciousness (for example, pain, visual awareness, and self-consciousness) may employ a basic common mechanism, or perhaps a few such mechanisms. Therefore, understanding and discovering the mechanism for one aspect may allow an understanding of the other aspects, too.

Although Crick and Koch accept that it's difficult to account for how conscious experience arises from the activity of the brain, they propose that there must be some specific underlying differences in brain-cell activity that lead to the phenomenon of consciousness. Thus, they propose that in order to study visual consciousness, it's important to identify the brain-based biological events that take place during visual consciousness and correlate them. It's hoped that these will ultimately help identify the specific mechanisms that lead to the phenomenon of visual awareness. Crick and Koch have observed that brain cells responsive to shape, color, and movement may become active in synchrony in the general range of 40 times per second (40 Hertz). They suggest that synchronized activation of brain cells in this range (roughly 40 times per second, but perhaps as low as 35 and possibly as high as 75 times) might be how the brain puts together visual consciousness.

Furthermore, as an area of the brain called the thalamus appears to play a central role in mediating consciousness, and conscious experience also depends on the surface of the brain or the cortex, they suggest that consciousness may depend on synchronized firing in the range of 40 Hertz in the networks of cells connecting the thalamus and the cortex. This is sometimes called "40-Hertz oscillation."

So, basically it is thought that this rhythmic and synchronized activity of

neurons may be the neural correlate of awareness and might serve to bind together activity concerning the same object in different brain areas. At present, however, there's little experimental evidence to support this suggestion directly, and it still doesn't account for how either the actual process of consciousness or the binding of consciousness arises.

Consciousness as a Property of Neuronal Computational Complexity

Daniel Dennett, an American philosopher and author on consciousness based at Tufts University, has expressed perhaps one of the most reductionistic and materialistic views regarding consciousness, which at first glance even he acknowledges appears counterintuitive!

In his view, there are no such things as subjective experiences; instead, he proposes that the brain is like a computer that has inputs from different sources with a disposition to a particular behavior and an ability to discriminate between different stimuli. He believes that much of what we learn is acquired simply through social imitation. So he has proposed that consciousness is essentially created through the global activity of brain circuits, which create a virtual "captain of the crew" or "self" that ultimately governs the overall functioning of the brain, but that the whole process is very much like a very complex computer that acts according to a program, without any "real" subjective experience. It is all a complex system of inputs and outputs and modulation of information with no actual subjective experience.

Dennett has proposed that at any given time, many modular cerebral networks (in other words, specialist networks of brain cells) are active in parallel, and process information in an unconscious manner. A piece of information then becomes conscious if the brain-cell population that represents it is mobilized by competitive, cooperative, and collateral activities into a brain-scale state of activity that involves many neurons distributed throughout the brain. Dennett postulates that this global availability of information is what we subjectively experience as a conscious state.

Other Brain-Based Theories of Consciousness

Many other theories have been put forward to account for the potential neural correlates of consciousness. A German neuroscientist, Hans Flohr, has argued that consciousness is dependent upon a specific receptor in the brain called the NMDA receptor. This is a receptor on which many anesthetics act, and as they can temporarily take away consciousness, Flohr has therefore concluded that the normal functioning of this receptor is required for consciousness. However, other researchers have argued against this, saying that there are other anesthetic drugs that do not act on this receptor. In addition, this receptor is involved in other brain processes as well, including unconscious states.

Gerald Edelman and Giulio Tononi from the Neurosciences Institute in San Diego, California, have proposed a biological theory of consciousness in which it's suggested that consciousness may arise from the interaction of two parts of the brain. They propose that a key mechanism underlying conscious experience is the interaction between an area that's involved in perceptual categorization and another area related to memory, value, and planning for action. It is thought that such interactions among groups of brain cells in different brain areas may be necessary in order to generate a unified brain-based process corresponding to a conscious scene.

In addition to the areas proposed in these theories, many other areas of the brain have been proposed to be the potential neural correlates of consciousness. However, although they were very interesting, all these theories seemed more or less to share the same limitations.

Some Limitations with the Conventional Brain-Based Theories

In general, evidence to back up the concept that mind and consciousness arise from the brain has come from the clinical observation that specific changes in function such as personality or memory are associated with specific areas of damage to the brain, such as those that occur after a head injury or stroke. This finding has been further supported by the results of studies using functional MRI and PET scanning, in which, as described above, specific areas of the brain have been shown to become active in

response to a thought or feeling. However, although these studies provide evidence for the role of neuronal networks as an intermediary for the manifestation of thoughts, they do not necessarily imply that those cells also produce the thoughts.

In fact, many scientists have argued that brain-based theories cannot fully explain the observed features of consciousness. The limitations of the conventional theories can be divided into four broad categories, which are examined below.

1. The nature of subjective experience. The most obvious limitation of such theories is that they don't provide a plausible mechanism that may account for the development of consciousness from brain-cell activity. The theories simply propose potential intermediary pathways that may be mediating consciousness but do not answer the fundamental question of how subjective experiences may arise from the activity of neurons. This is a point that has been summarized very well by Professor Greenfield. She concludes: ". . . just how the bump and grind of the neurons and the shrinking and expanding of assemblies actually translate into subjective experience—is, of course, another story completely."

2. The binding of spatially distributed brain activities into unitary objects such as consciousness. How do brain activities that are distributed within multiple areas of the brain bind into a unitary sense, such as occurs with vision, or the development of a coherent sense of self? In other words, how do we go from multiple inputs from millions of brain cells to a single picture or a single sensation of the self?

3. Transition from pre-conscious processes to consciousness itself. The theories proposed do not account for how an event that is pre-conscious (in other words, chemical or electrical events that aren't "conscious" as we know it) becomes conscious, other than to say that it "somehow" occurs at a critical point.

4. Free will. A fundamental part of our lives involves the notion of free will. We're judged in society based upon our intentions and actions, and the brain-based views expressed above cannot account for this. If correct, they would mean that our lives would be completely determined by our genes and environment, and hence there would be no place for personal accountability.

Can you imagine the situation that would arise if everyone claimed that everything they did was due to the action of their genes in combination with their environment? No one could really be held accountable anymore! Thankfully, society still runs with the notion of free will and personal accountability.

These and other limitations with the conventional views have led some scientists to seek alternative explanations for consciousness.

Nonconventional Theories

Quantum Processes

Stuart Hameroff, an anesthetist at the University of Arizona, and Roger Penrose, a mathematician from the University of Cambridge, have raised many of the limitations of the theories above. In particular, they argue that these theories cannot fully explain the observed features of consciousness.

The quantum-processes theory put forward by Hameroff and Penrose is based upon the principle that there are two levels of explanation in physics: the familiar classical level used to describe large-scale objects, and the quantum level used to describe very small events at the subatomic level.

At the quantum level, superimposed states are possible—that is, two possibilities may exist for any event at the same time; but at the classical level, either one or the other must exist. So, for example, we can either go right or left, but not both. When we make an observation, we're working at the classical level, so although there may be subatomic processes going on at any one time, with the potential of different superimposed states, when we make an observation, the superimposed states have to collapse into one.

Hameroff and Penrose propose that consciousness arises from tiny tube-like structures made of proteins that exist in all the cells in the body, including brain cells, and act as a skeleton that allows cells to keep their shape. They propose that these small structures are the site of quantum processes in the brain, due to their structure and shape. They argue that consciousness is thus not a product of direct brain-cell to brain-cell activity, but rather the action of subatomic processes occurring in the brain.

In support of their theory, they further argue that there are single-celled organisms such as amoebae that, despite lacking brain cells or synapses, have consciousness and are able to swim, find food, learn, and multiply through their microtubules. Hence, they suggest that this may be a more advanced structure leading to consciousness.

So Hameroff and Penrose propose that consciousness may arise from subatomic quantum processes occurring in the protein structures that make up the microtubules. They argue that these tubelike structures undergo switching between two or more states, due to the action of weak chemical attraction forces, a process that takes place within nanoseconds. It is thought that the microtubule conformational changes could support classical information processing, transmission, and learning within neurons. Therefore, Hameroff and Penrose argue that owing to these processes, at any one time there may be a number of different quantum states or possibilities, and when a decision is made, it's the result of the collapse of one state, which then reaches consciousness. This is called the Orchestral Objective Reduction (Orch OR) theory.

Other Nonconventional Views

Some have, however, argued against the Orch OR theory by pointing out that microtubules exist in cells throughout the body and not just in the brain. Also, there are drugs that can damage the structure of microtubules but appear to have no effect on consciousness. More important, it has been argued that although the Orch OR theory may potentially account for how the brain carries out complex mathematical problems, it still fails to answer the fundamental question of how subjective experiences and thought processes arise.

This limitation of all the theories mentioned above has led to the suggestion that consciousness may in fact be an irreducible scientific entity in its own right, similar to many of the concepts in physics, such as mass and gravity, which are also irreducible entities. The investigation into consciousness has thus been proposed to be similar to the discovery of electromagnetic phenomena in the 19th century or quantum mechanics in the 20th century, both of which were inexplicable in terms of previously known principles.

Some, such as David Chalmers, have argued that this new irreducible scientific entity is a product of the brain, whereas others have argued that it's an entirely separate entity that's not produced by the brain.

The late Sir John Eccles, a neuroscientist who won the Nobel Prize for medicine in 1963 for his work on brain-cell connections and was considered by many to be one of the greatest neuroscientists in the world, was perhaps the most distinguished scientist who argued in favor of such a separation between mind, consciousness, and the brain. He argued that the unity of conscious experience was provided by the mind and not by the neural machinery of the brain. His view was that the mind itself played an active role in selecting and integrating brain-cell activity and molded it into a unified whole. He considered it a mistake to think that the brain did everything, and that conscious experiences were simply a reflection of brain activities, which he described as a common philosophical view: "If that were so, our conscious selves would be no more than passive spectators of the performances carried out by the neuronal machinery of the brain. Our beliefs that we can really make decisions and that we have some control over our actions would be nothing but illusions."

He further argued that there was "a combination of two things or entities: our brains on the one hand and our conscious selves on the other." He thought of the brain as an "instrument that provides the conscious self or person with the lines of communication from and to the external world, and it does this by receiving information through the immense sensory system of the millions of nerve fibers that fire impulses to the brain, where it's processed into coded patterns of information that we read out from moment to moment in deriving all our experiences—our perceptions, thoughts, ideas and memories."

According to Eccles, "We as experiencing persons do not slavishly accept all that is provided for us by our instrument, the neuronal machine of our sensory system and the brain, we select from all that is given according to interest and attention and we modify the actions of the brain, through 'the self' for example, by initiating some willed movement."

Eccles's theory was well described in his book *The Self and Its Brain.* However, he acknowledged that he was still unable to explain how the mind carried out these activities and how it interacted with a separate brain. This is a point on which he was criticized by others.

In a number of books and numerous lectures held at the Sorbonne in Paris, Bahram Elahi, a professor of surgery and anatomy with an interest in consciousness, has expressed the view that although the mind and the brain are separate, nevertheless the mind or consciousness is not immaterial. Rather, it is composed of a very subtle type of matter that, although still undiscovered, is similar in concept to electromagnetic waves, which are capable of carrying sound and pictures and are governed by precise laws, axioms, and theorems.

Therefore, in Elahi's view, everything to do with this entity should be regarded as a separate, undiscovered scientific discipline and studied in the same objective manner as other scientific disciplines. He argues that as science is a systematic and experimental method of obtaining knowledge of a given domain of reality, then "consciousness" can and should also be studied with the same objectivity. Each scientific discipline such as chemistry, biology, and physics has its own laws, theorems, and axioms, and in the same manner, "consciousness" should also be studied in the context of its own laws, theorems, and axioms. In his view, consciousness is also a scientific entity and a type of matter; however, it's a substance that's too subtle to be measured using the scientific tools available today. So, in his view, the brain is an instrument that relays information to and from both the internal and external world, but "consciousness" is a separate subtle scientific entity that interacts directly with it.

This seemed to me to be a very different way to tackle the problem of consciousness. Essentially what Eccles and Elahi seemed to be saying was that consciousness was a separate entity from the brain, interacting with it but not necessarily produced by it. This view, largely a dualist one, was more in line with the views of philosophers such as Descartes rather than those of most modern scientists; however, in view of the lack of plausible biological mechanisms to account for consciousness being a product of brain-cell activity, it had to be considered.

I knew from the history of science that scientists had often been confronted with problems that had been unsolvable when examined using the scientific principles of the time. For example, when the British scientist James C. Maxwell first discovered electromagnetic phenomena in the 19th century, electromagnetism had to be described as a scientific entity in its own right, as it could not be explained according to known scientific principles. It was

many years later that the first radio waves (which are electromagnetic) were recorded by the German scientist Heinrich Hertz, and now we have an entire area of science that's based upon them—not to mention numerous devices such as radio, television, microwaves, and infrared cameras. Maybe consciousness, too, was not reducible in terms of currently understood mechanisms of brain-cell activity, and its true nature would only be discovered when our science progressed further, but the major point for study now was whether or not consciousness was produced by the brain or could be a separate entity.

At the end of my study of the literature on the nature of consciousness, I came to the conclusion that we would have to accept either the broad view that mind and consciousness are by-products of brain-cell activity, or the view that they form a separate undiscovered entity. Either way, we didn't seem to have the scientific tools to measure mind or consciousness, so a way was needed to study them and their relationship with the brain indirectly. Until now there had been no way to test any of these theories experimentally.

Perhaps studying the state of the human mind during cardiac arrest would help unravel the mystery. This seemed to be the only time when we could study the state of the human mind at a time when circulation to the brain had shut down to a point where there was no recordable electrical activity in the brain centers. Yet if consciousness truly continued and could be demonstrated objectively, as many had claimed, surely this would be a very significant discovery regarding the nature of consciousness and the state of the human mind at the end of life.

❑❑❑❑❑❑

CHAPTER SIX

THE INGREDIENTS OF LIFE

As I thought about the nature of consciousness, I thought back to an experience that I'd had a few years back during a research trip to Sweden. One day my hosts had taken me out to the countryside to show me Swedish country life. That morning we all baked a very delicious flat Swedish bread. I enjoyed it very much, and the memory of that day still lives on in my mind.

Although at first glance it may appear that baking bread has nothing to do with the nature of consciousness, that day, from just a few simple ingredients, we'd made something tasty and delicious. Come to think of it, it wasn't just bread that was made of simple ingredients—everything that we use and interact with in our daily lives and the world beyond is made up of simple ingredients, too. This includes the food we eat, the objects we use, our homes, and of course, all living beings, including ourselves.

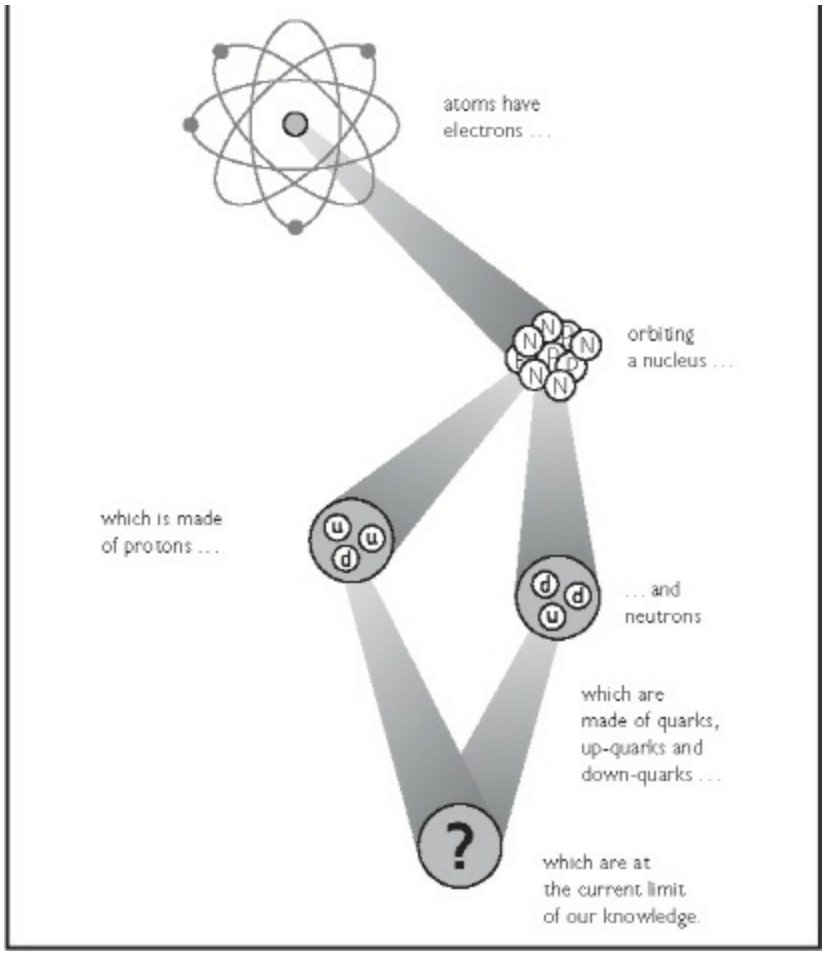
I had to think back to basic principles. We exist within the wider universe, and so does our consciousness. Although science is not yet able to measure consciousness, undoubtedly it does exist and is therefore confined within the realms of physics and matter. Therefore, it should be bound by the same universal laws that govern all other beings and matter, just as we ourselves are.

I thought about the ingredients that make me what I am. Basically, I'm a collection of billions of cells, which are themselves composed of numerous molecules. These cells communicate with each other through other molecules, and the end result is an incredibly precise yet complex machine that is unrivaled. But even the molecules in my body are themselves made up of different combinations of atoms, and the atoms themselves are also made

up of simpler constituents. We now know, through the science of quantum physics, that everything in the universe is made up of basic particles of matter.

Of course the idea that all beings are made of more fundamental structures is nothing new. It actually dates back to ancient Greece. The philosopher Democritus was arguably the first to put forward the idea of atoms. However, it was the 19th-century British scientist John Dalton who formally advocated that everything was made from tiny atoms. Later on, scientists not only accepted that atoms existed, but also discovered that some atoms shared similar chemical properties. This discovery allowed atoms to be categorized into groups, known as the periodic table. It also indicated that atoms themselves must be made up of simpler building blocks. It was the simpler building blocks in different combinations that determined the specific chemical properties of the atoms.

At the turn of the 20th century, scientists went on to discover that the atom had a small dense nucleus, made of protons, which had a positive charge, and neutrons, which had no charge. As the century progressed, it was discovered that negatively charged particles called electrons were in constant motion around the nucleus, and that the protons and neutrons that made up the nucleus were composed of even smaller particles, called quarks. The majority of the atom is actually made up of the nucleus.



Although at school I was taught that everything is made up of atoms, I came to realize that atoms themselves are made up of fundamental subatomic particles. These are called quarks and leptons, and when combined together, make up "larger particles," eventually atoms and then molecules. The fundamental particles sometimes behave like waves and sometimes like particles, and are connected through vast distances at speeds greater than the speed of light. Here we see that the atom is made up of a nucleus that is itself made up of neutrons and protons (these are made up of the more fundamental particles, the quarks) and also electrons.

(*Source:* **www.particleadventure.com**)

Throughout the 1950s and 1960s, physicists raced forward in their attempts to discover the particles that made the building blocks of the atoms and, hence, the universe, and numerous particles were discovered. Later, in the 1970s, scientists formulated the Standard Model, in which the large number

of particles was explained as different combinations of a relatively small number of fundamental particles. This model describes all matter and the interactions between them, and now, using it, physicists are able to explain what the universe is composed of and what holds it together.

All the known matter particles are composites of a number of fundamental particles called quarks and leptons. Quarks exist in groups with other quarks, and thus make up composite particles, which in turn make up larger particles. There are a total of six quarks and six leptons. The electron is the main lepton, although others also exist. So everything, from the smallest atom to molecules, cells, animals, humans, mountains, planets, and galaxies, is made from these fundamental particles—everything, including me, with my sense of self and consciousness, sitting here questioning the whole thing, asking why and how!

We also know that objects and matter in general interact with each other, sometimes across great distances. Just think of the effects planets have on each other, or how the moon and the sun make the waters in our rivers and seas rise up and down, or how magnets attract or repel without touching. There are, therefore, invisible forces in the universe that can act at different distances without touching each other.

How do forces interact “invisibly” across such distances? Scientists have discovered that all the forces in the world can be attributed to just four interactions. These are called gravitational interaction, electromagnetic interaction, and “weak” and “strong” interactions. They affect matter of different nature and across different distances. Gravitational interaction affects particles with mass, and governs the large-scale structure of the universe because of its infinite range. Electromagnetic interaction affects particles with charge. It, too, has an infinite range, but is much stronger than gravity. The other two forces act at very short ranges at the subatomic level. Strong interaction affects the particles that are made from quarks, whereas weak interaction affects all particles. It is, as its name suggests, very weak, and its range is extremely short.

So even though I had always thought of a “force” as something that just happened, I realized that according to physics at a fundamental level, a force isn’t an event that just happens between particles; it is itself also due to the exchange of other particles, called “force-carrier particles.” Forcecarrier particles are thus a group of particles that carry different forces between other

particles such as quarks. In the case of light or radio waves, which are part of the electromagnetic spectrum, the force carrier particles are known as "photons" and can travel at the speed of light. Although the force-carrier particle for gravity hasn't yet been discovered, it is thought to exist, and has been named "graviton." The exchange particles that act between quarks and mediate the strong force are called "gluons." So, ultimately, all beings and all interactions take place through just a few basic particles.

Looking back through the years and observing how scientific progress has taken place, it became clear to me that at some time in the future it may be discovered that quarks and electrons may not be fundamental after all, and are themselves made up of other particles. However, as far as we know today, quarks are like points in geometry. They're the fundamental building blocks of the universe. And even if there are more fundamental building blocks, the concept remains the same: The entire universe is made up of combinations of elementary subatomic particles.

Wave-Particle Duality

A very interesting discovery that took place in the 20th century was that light, which is a wave, also has the properties of particles in certain situations. When light travels, for example, it behaves like a wave, but when it arrives at a surface, it behaves like a particle. So it was discovered that light could be both wave and particle.

It was then proposed that if waves could sometimes behave like particles, perhaps the reverse could also be true. Experiments carried out by Louis de Broglie, and then independently confirmed by others, demonstrated this to be the case. So it was shown that other matter is also like light. Thus, matter can exhibit the properties of both waves and particles. So the fundamental building blocks that combine to build up all living things are essentially a type of matter that can act like a particle at times and a wave at other times.

Quantum and Non-Locality

According to discoveries made by quantum physics, there's also a

phenomenon known as “non-locality,” or action at a distance, where particles can act on each other across great distances and at a speed even greater than light. To many people this has profound implications, as it means that many events may be interconnected and may also suggest that even the mind or consciousness can act in a “non-local” manner.

Like many others who’ve studied these concepts, I was really intrigued by the potential implications of the findings that have been made in the subatomic world. It was so interesting that things can behave so differently when studied at a very small level, and that sometimes their behavior may even appear to be opposite to our own concepts of how things should be.

I could not help but wonder what role these processes could play in consciousness and the human mind.

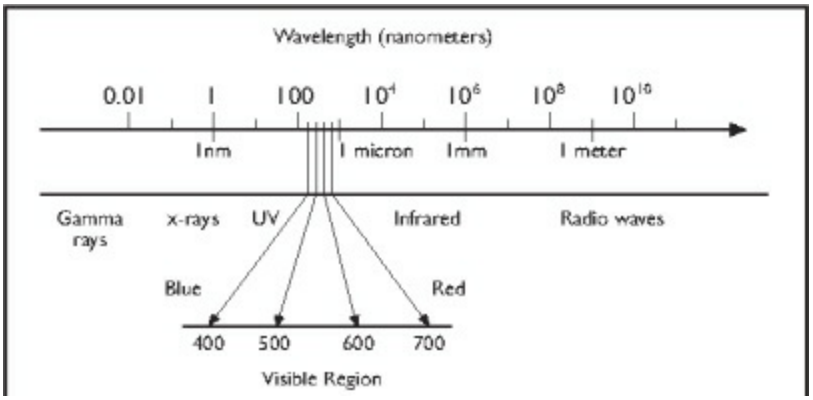
The Possible Nature of Consciousness

Since everything else in the universe is made up of combinations of subatomic particles, then consciousness must also be made up of these particles. They combine to form different types of matter, some of which we can perceive with our senses and others that we cannot. So, in order to answer the big question about how consciousness arises, I realized that we as researchers need to maintain a completely open mind.

It’s obvious that there’s much more to the world than what we can perceive with our senses. All we have to do is turn on our TV or radio or use a cell phone, and this becomes obvious to us. Our senses are like tools with which we can understand the world beyond; however, like any tool, their range of function is necessarily limited. Our eyes and the circuitry that connects them to the brain can detect light waves, for example, and then decode these in the brain as images of the world outside. But light is simply one of the waves that make up the electromagnetic spectrum (see the table on page 134). There are also others such as radio waves, infrared rays, x-rays, and microwaves. We can’t detect these waves, simply because they’re at a frequency that our eyes are unable to pick up. The human eye can only detect electromagnetic waves with a wavelength that lies between 400 millionth of a centimeter and 700 millionth of a centimeter.

When a wavelength gets longer than this, it’s called infrared. Although

we’re incapable of seeing in this range, it’s thought that some snakes can. When the wavelength gets shorter, it’s called ultraviolet. Again, although we’re not capable of seeing in this range, bees can. We know of no animals that are capable of detecting waves either shorter than the ultraviolet range or longer than the infrared range, but we can measure and make use of these wavelengths through specific instruments, such as x-rays and CT scans, and other devices such as radios, cell phones, and TVs. But at any time there’s also more in the world than we can detect even with our instruments—that’s why new devices and instruments are constantly being developed to help us understand more of the world around us.



Electromagnetic spectrum

Interestingly, although we cannot detect electromagnetic waves without the appropriate instruments, they’re capable of conveying sounds and pictures. So these subtle waves, which are made up of very basic subatomic particles, can convey a great deal of information, including elements such as sound and vision, which are part of our own consciousness. It may, therefore, be that a combination of fundamental particles can lead to the formation of both our physical body, with cells and organs that we can perceive with our senses, and also our consciousness and thoughts, which are of a more subtle type of matter that we are unable to measure today, simply due to a lack of instruments. In the same way that 50 years ago we were unable to “see” in the dark whereas today we can do so using infrared cameras, undoubtedly in the future we’ll have instruments that can detect thoughts and consciousness.

The question that then arises is: Are these thoughts and levels of consciousness simply a product of brain-cell activity, and therefore only exist

within the skull, or are they produced through a different mechanism and can they function beyond the brain and even become non-localized? This is where I saw a potential role for the study of human consciousness during cardiac arrest, and it was here that my questions became even more intriguing.

❑❑❑❑❑❑

CHAPTER SEVEN

IS IT REAL?

In September 2002, a headline appeared on the Website of CBSTV: “Out-of-Body Experiences Explained.” This was in fact one of the headlines that had appeared in many of the global media outlets following the publication in the leading scientific journal *Nature* of the bizarre occurrence that happened to a 43-year-old patient being treated for epilepsy.

A group of Swiss doctors had carried out a procedure that is often performed on patients with intractable epilepsy. Electrodes are implanted in the brain and used to stimulate different portions of it. The aim is to find an abnormal brain circuit that is causing the recurring seizures. In this case, as the doctors had been doing this, quite unexpectedly the patient had reported seeing herself “lying in bed, from above” and also “floating” near the ceiling. However, she had not had a full out-of-body experience, as she had only been able to see her legs and lower trunk.

Despite the fact that this wasn’t quite like the other out-ofbody experiences I had come across, it seemed to me that the Swiss doctors had been able to induce an out-of-body–like experience in someone. This seemed to suggest that the reported sensation of leaving the body during a brush with death might simply be an illusion created by the abnormal stimulation of a specific area of the right side of the brain called the *angular gyrus.* In fact, the Swiss study had concluded that out-of-body and near-death experiences might be influenced by a portion of the brain misfiring under stress.

This finding had touched on one of the greatest debates that had been taking place ever since the first reports of NDEs and outof-body experiences: were these experiences real, or were they illusory products of normal or abnormal brain activity?

To many people, the Swiss study certainly seemed to indicate that these

sensations were just illusions. One psychologist, Michael Shermer, had been reported as saying, “It’s another blow against those who believe that the mind and spirit are somehow separate from the brain. … In reality, all experience is derived from the brain.”

Others had been more cautious. Psychiatrist/professor Bruce Greyson of the University of Virginia, the researcher who had devised the Greyson scale, had suggested that the experiment did not necessarily prove that all out-of-body experiences were illusions. He had been reported as saying, “We cannot assume from the fact that electrical stimulation of the brain can induce out-ofbody-experience– like illusions that all out-of-body experiences are therefore illusions.”

So what is the truth? Are NDEs real, or are they simply hallucinations or illusions that feel very real to those who have experienced them?

For years I wondered why there was such intense debate about this. After all, it is reasonable to have debate concerning subjects that are controversial, but the debate relating to NDEs was pretty clichéd, and to me essentially seemed to mirror the participants’ personal and philosophical views. Most of the people who’d had an NDE truly believed that they had encountered the afterlife. For many others, NDEs were a positive confirmation of their belief in the afterlife. Other people, however, thought that the experiences could not be real, as they personally believed that everything ended after death.

Unfortunately, for many years, lack of scientific evidence meant that the debates had by definition been limited to personal views, whether from those who believed that these experiences indicated a glimpse of an afterlife or those, including some scientists, who believed that they were nothing more than hallucinations.

I had always been a little disappointed by scientific colleagues who publicly claimed that NDEs were simply hallucinations resulting from a lack of oxygen or some other chemical process within the brain. Although I had always thought that the reasoning behind this argument was quite eloquent, there had never been any evidence to support it. So it should only have been discussed as a possibility rather than an actual scientific fact.

The argument usually revolved around the concept that activation of a certain area of the brain or receptor in the brain could lead to hallucinations, and that these hallucinations shared similarities with NDEs and therefore NDEs must be hallucinations. The out-of-body experiences that accompany

NDEs were often thought to be simply illusions, and thus both NDEs and out-ofbody experiences had been considered “unreal” events that had just felt “real” to the people who had experienced them.

This is a very simplistic way of looking at a complex subject that needs further clarification and explanation. What many who put forward this argument fail to mention is that the very areas of the brain that are involved with hallucinations are equally involved with many of our “normal” and “real” experiences and emotions such as anger, love, and so on. Therefore, simply identifying those areas of the brain as being involved with NDEs cannot tell us whether or not those experiences are real or hallucinations.

In order to be able to understand the significance of NDEs, we really have to go back a few steps and critically examine how we experience the world and, more important, what we mean by “reality” and what distinguishes “reality” from a hallucination or an illusion.

What Is Reality?

While researching the material for this book, one day I decided to call up a colleague, Dr. Ebby Elahi, for some advice and suggestions. He and I had spent some time together at Mount Sinai Hospital in New York over 12 years ago. I consider him to be an extremely intelligent and very well-read medical doctor, not just in his own field but also in allied subjects such as psychology, sociology, and neuroscience. On top of all this, he is also very modest and a great person to consult. He has always had a real passion for scientific discovery and analysis, and during my student days we had many fascinating discussions, so I wanted to ask him for his views on near-death experiences.

During the conversation, he brought up a very interesting point regarding the whole debate about whether or not NDEs are hallucinations or not. To him, from a scientific standpoint, the arguments were ultimately somewhat futile. I remember being struck by this analysis and asked him to elaborate. He explained:

> Reality, as we know it, is not neurologically determined, but is rather determined socially and our understanding of it is necessarily limited by the limitations of our body and in particular our brain. So what we consider reality is only the aspect that we are able to perceive using our senses and brain in the context of the meaning that society gives to that particular event. We cannot know whether reality exists beyond that. Any personal experience, including an NDE, may be real to the

person who has experienced it, but since we have not had that experience, we cannot say that it is or is not real.

If everyone in society shares a particular experience, such as love, then society gives meaning to that experience and says that it is real. If, however, an experience feels real only to a small minority and is not experienced by the majority, then it is often not considered real. Nevertheless, both experiences are mediated by chemical changes in the brain. Moreover, identifying chemicals and activity in the brain does not tell us anything about whether an experience is real or not. In fact, all experiences are mediated by chemical changes in the brain, and so identifying a particular brain-based substrate doesn't tell us about the external reality of an experience. Therefore, as scientists we can never say whether someone's personal subjective experience, such as an NDE, is truly real or not by studying brain areas that become active or not. It is society that gives an experience meaning or reality, and not neurology or neuroscience. . . .

We had a long discussion, and I was very impressed by Ebby's knowledge and analysis of a complex situation. Until that time, I had never come across such a novel way of thinking. People usually spoke about NDEs either in the context of hallucinations or the afterlife. Ebby, however, had looked at the subject completely differently and analyzed it based upon current scientific knowledge.

When he explained his points more fully to me, I realized how completely correct his analysis was. Behind his arguments lay many vital concepts that needed to be better understood, such as what we define as reality and the role of the brain, neuroscience, and society in determining that reality.

Many Realities

Most people agree that there exists a world of "reality," a world of objects and phenomena that is external to, and independent of, us and that which we interact with. This reality has existed before us and will continue to exist whether or not we exist and whether or not we believe in it.

The laws that govern the universe are good examples of this. They have all existed throughout time, yet it has taken us thousands of years to discover them. It has been only relatively recently, for example, that scientists have discovered the existence of electromagnetic waves. Now we use them for many daily activities that we take for granted, such as watching TV or listening to the radio. Yet if anyone had mentioned to people 200 years ago that there was an "invisible" force that could carry sound and pictures that could be retrieved or instantly sent thousands of miles away, most people

would not have believed them. Electromagnetic waves have nevertheless always existed. So, there is a type of "reality" that exists whether or not we believe in it.

Logically, it would thus be acceptable to conclude that there are many other "realities" that we are not aware of that exist nonetheless. We may in fact discover them with time. Who knows what realities we will discover in another 100 years, or for that matter, 1,000 years?

In addition to this type of reality, there is also the "reality" that applies to us as humans. This is "reality" as we picture it, the reality we are able to appreciate and comprehend. Since it is based upon and necessarily limited to how and what we are able to perceive and understand of "true" reality at any given time, this may correspond to "true" reality, or it may not. Nevertheless, this is the reality that we believe in and discuss during our everyday lives.

Thus, there may be many realities—in other words, phenomena that we cannot perceive using our senses and brain. And of those that we can indeed perceive, our understanding is necessarily limited by our senses, our brain and, very importantly, the social meanings that we give to them.

Society has a key role to play in determining these realities. In fact, there is an area of sociology called "social constructionism of reality" that is concerned with discovering the ways in which individuals and groups create their perceived reality. It involves looking at the ways in which social phenomena are created, institutionalized, and made into tradition. Social construction describes subjective rather than objective reality—that is, reality as we can perceive it rather than reality as it may be. "True" reality may correspond with reality as we know it or it may actually be very different from what we perceive.

How Do We Determine Reality?

In his book Sociology: *A Down-to-Earth Approach,* Professor James Henslin, a well-known sociologist, explains this subject very well: "Nothing contains built-in meaning and whatever meaning exists is socially determined and thus arbitrary." When we talk about society here, we are referring to society in general, including scientific societies and groups such as physicists and biologists, and so on. We, within society, have given events, phenomena,

observations, and objects a certain meaning, but we could just as well have given them a different meaning. It is through a social process that we determine meanings: that is, people jointly decide on the meanings to assign to events and objects. Since meanings are arbitrary, people can change them, so that when circumstances change, the older definitions can become "outmoded"—even definitions about fundamental aspects of life. This is typically what happens in science. As more information becomes available, we change our definitions of reality.

In these circumstances, even though older definitions may no longer work, changes in basic orientations do not come easily. Usually, change takes place with a great deal of resistance. In some instances, the people who suggest such changes are seen as being threatening to the old order; and they may face reactions such as shock, horror, and ridicule. For those who persist on the "threatening" course, there can be more severe reactions, such as being shunned by their society and facing ostracism and even violence.

In general, the source of radical new ideas is very important in determining whether or not they gain acceptance within society. If the person proposing the new ideas is authoritative, then their views will be accepted far more easily than those of someone who is perceived as being less important. Also, if an individual can drum up group support, this often helps to bring about social change and social acceptance for the new definition.

Interestingly, sociological experiments have demonstrated that if something is believed by enough people, others will also start to believe it. It is also possible to make either a person or whole societies change their mind about what they consider to be "reality," if they believe that others don't agree with it. So again, if the group that offers the new definition can get enough others to accept it, the common definition of reality will change.

When we look at our recent history, we can identify many examples of this. At one time the definition of reality was that women were inferior to men, for example, and thus had fewer rights. In the last 100 years, this definition of reality has slowly begun to change. Similarly, in many countries, including the U.S., until only relatively recent times black people had far fewer rights than white people because of the idea that they too were inferior. In this case, reality has changed slowly and painfully and with a lot of resistance. There are many other firmly held "realities" that are slowly undergoing change in various societies in this day and age.

Science and Reality

There are numerous historical examples of how reality is determined socially and how it is changed with time. Since we are concerned with the scientific understanding of the phenomena of near-death experiences, however, I will refer to a few examples that relate specifically to science.

During the early part of the 16th century, the generally accepted reality, as regards the position of the earth, the sun, and other planets, was that the earth lay at the center of the known world, and the sun and planets revolved around it. This "reality" was grounded in the observation that when people looked out at the sky, they could see that the moon, the sun, and other planets did indeed move their position in relation to the earth. It certainly looked as if the sun was turning around the earth, so this belief wasn't just grounded in blind faith, but in objective and reproducible observation. One could argue that it was scientific, in the sense that it could be verified objectively; however, as we all know now, it just wasn't correct.

In 1543, a little book was published entitled *On the Revolutions of the Celestial Spheres.* It was written by the Polish astronomer Nicolaus Copernicus. In it he claimed something extraordinary and certainly very controversial: that it was not the sun that moved around the earth, but the other way around. He had come to this view through his observations of the heavenly bodies. He proposed that the reason why people had always considered that the sun revolved around the earth was that the earth turned on its own axis and thus gave the impression that the sun was revolving around it. This was quite a revolutionary idea, and understandably it met with a lot of resistance at that time. Surely this man was wrong, especially since his suggestions not only stood against the prevailing religious belief but also the views of the great Greek philosopher Aristotle!

Just over 20 years later, Galileo Galilei was born in Italy; and after studying medicine, philosophy, and mathematics, which he taught as a professor, and working on a variety of scientific projects, he became one of the biggest supporters of Copernicus's theory. In 1614, he was accused of heresy for his support of this theory, and in 1616 he was forbidden by the Church from teaching or advocating it. For the next several years, Galileo

stayed well away from the controversy, but when in 1623 a Pope was elected who had been a friend and admirer of his, he suddenly found a new opportunity to discuss his beliefs. The Pope gave Galileo permission to write a book on the subject, as long as it included the pros and cons of both arguments and also the Pope's own views. He also insisted that Galileo should not advocate the view that the earth rotated around the sun.

However, Galileo did not follow these instructions accurately, and in 1632, after his book *Dialogue Concerning the Two Chief World Systems* was published, he was summoned to appear before the Inquisition in Rome and was forced to publicly withdraw his support for Copernican theory. He was also convicted and sentenced to life imprisonment, although this was later reduced to permanent house arrest. Galileo thus remained at home until he died in 1642. It was not until over 100 years later, in 1741, that he was formally rehabilitated, when the then Pope authorized the publication of his complete scientific works; and in 1758 the Church finally removed the prohibition against the belief that the earth revolved around the sun, thus ending a debate that had run for over 200 years.

This is a very good example of the social construction of "reality." Whether or not we believe in it, the earth rotates around the sun. This has been happening for as long as the earth has been in existence, but for centuries the limitations of people and their "experiments" suggested that the earth was at the center and the sun revolved around it. Using only their five senses, people could not have concluded differently. It was only when new instruments were developed that allowed the scientists of the 16th and 17th centuries to study the planets that they realized that the commonly held "reality" had in fact been incorrect. Those who suggested the need to change the old version of "reality" were initially treated with shock and ridicule. Galileo, who persisted on this disorienting course, was almost killed. But then, in the decades that followed, as more and more people agreed with Galileo and Copernicus, eventually the version of reality was changed.

This example also demonstrates that our understanding of reality is initially limited by our five senses and the computational limitations of our brain. When we develop new instruments, such as telescopes in the case above, we become capable of understanding more of the reality as it truly is, rather than how we believe it to be.

The history of science is full of such events; in fact, almost all scientific

discoveries have followed a similar course, as outlined by Professor Henslin and studied by sociologists. To take another example, when Michael Faraday, whom many people consider to be one of the greatest experimental scientists of all time, first studied electricity in the 18th century and observed that the passage of an electric current through a wire caused a nearby compass to move, he explained it by suggesting that an "invisible" force was stretching out from the wire and affecting the compass. According to scientists of the time, that was nonsense—electricity traveled through the wire and thus no "invisible" force could be interacting with the compass. However, Faraday eventually demonstrated the existence of what we now call "electromagnetism," and his work is now used in everyday life. We can still not see this "invisible" force, but we have devised methods of measuring it using instruments that can determine more of reality than our eyes can.

The work of Albert Einstein provides another good example of the social construction of reality. Einstein is now considered to be one of the greatest, if not *the* greatest, scientist of all time, but he did not receive quite the same attention when he started his groundbreaking work. When he published his ideas in 1905, including his theory of special relativity, no one paid much attention to him. At the time, he was working in a patent office in Switzerland and was not taken very seriously as a physicist. In fact, one of the major reasons why Einstein's theories did start to be taken seriously in the early years was the fact that Max Planck, a very well-respected physicist, thought that his work was of value. So, again, "reality" was changed due to the influence of an important person within a social circle, in this case the world of physics.

Therefore, we perceive a certain "reality" that is based upon what we are able to detect using our five senses, or any instruments that we may have discovered at any given era, together with the ability and limitations of our brain to interpret and compute our observations. Also, each culture and society (that is, all social groups including scientific groups and societies) provides guidelines as to how to view the world, and in effect determines what is real for any given era and place. So reality is essentially limited to what we can perceive and to what is socially accepted.

Neuroscience: The Limiting Role of the Brain and

Senses in Perceiving "True Reality"

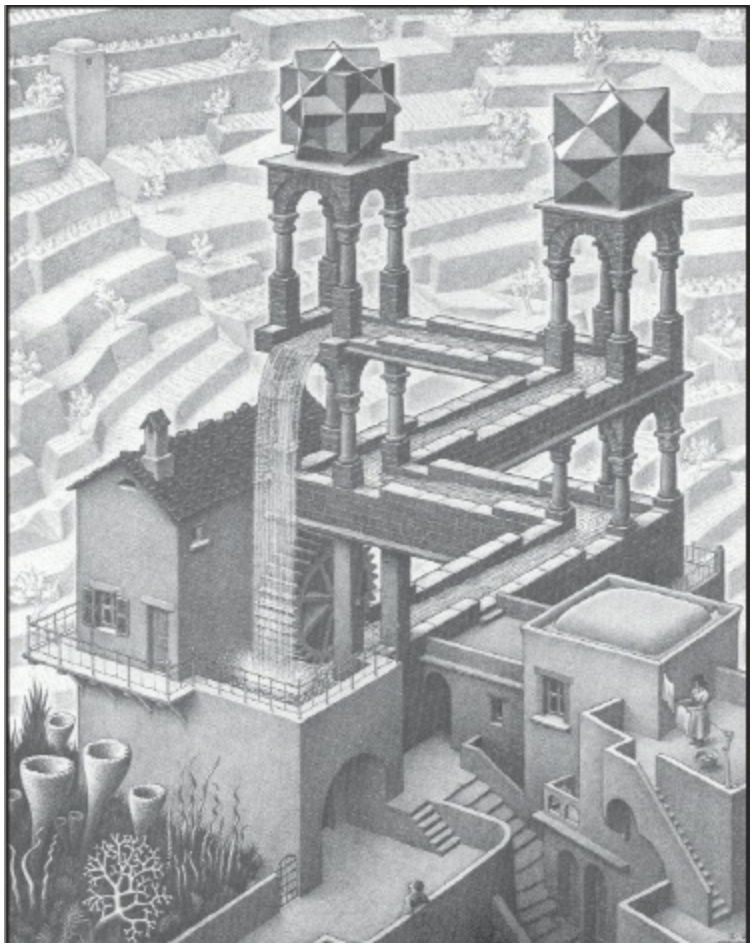
In order for us to understand something of the true realities that exist, we have to use our brain and senses. These are the tools we have.

The human brain and the five senses that are connected to it can be likened to a very complex computer that is able to perform complex computational analysis of data received from the sensors attached to it. There is, however, an inherent limitation in this system: all of our five senses are limited in the data they can gather from the world around us. Simple examples of these limitations are revealed when we examine the animal kingdom. A bee's eye or a snake's eye can detect wavelengths that our eyes cannot. Dogs have a far more sensitive sense of smell than we have—that's why we use them in our ports and airports to look for illegal substances.

Of course we are able to build various devices to help us detect things that lie outside the range of our physical senses. When we examine cells in a laboratory, we cannot see the individual cells with our eyes, yet if we use a light microscope we can see them in detail, and if we use an electron microscope we can even see the individual structures that make up each cell. We can't, however, see the individual atoms that make up the cells. Therefore, despite all of our instruments, we are still limited in what we can detect and thus perceive.

Another important reason for our limitations is that not only are all our senses limited, but so is our brain. A simple example is our ability to interpret what we see when we look at visual illusions. Sometimes the brain simply cannot interpret the information coming to it from the senses. I recall my own reaction when I first came across an Escher picture [see next page]. When we follow the water pathway up, it all makes sense until we reach the waterfall—and then it made no sense at all. Somehow our eyes and brain are limited in their ability to interpret what they see! This is also true of many other so-called visual illusions.

❑❑❑



M. C. Escher's *Waterfall.* Looking at these pictures made me realize that my own brain was limited in its ability to perceive and determine reality.

(*Source:* © M. C. Escher Company-Holland. All rights reserved. **www.mcescher.com**)

It doesn't take much to appreciate, then, that we may have at least significant physical limitations in trying to fathom aspects of the universe that lie beyond our own everyday three-dimensional world, where our brain and senses have developed to function at their best. When we go beyond this range of function, we cannot easily determine and comprehend the realities. And if there is an external reality that our brain cannot calculate or comprehend, then we may not even be aware that it exists. So it would make sense to accept the possibility of an external reality beyond what we are able to determine at any given time.

LIVING IN A MULTIDIMENSIONAL WORLD

Another good example that illustrates our limitations in comprehending reality comes from the world of physics. We are so familiar with our three-dimensional world that we may not have even thought about it, but might there be other dimensions, and if so, what would they be like?

In modern times, physicists have actually discovered, through mathematical calculations, that within the universe there are multiple dimensions beyond our familiar three-dimensional world. At this time it is thought that there are at least ten dimensions in existence. One of the best-recognized scientists in this field is Professor Lisa Randall, a Harvard physicist, who in her book *Warped Passages: Unraveling the Mysteries of the Universe,* discusses this subject in great detail.

What do these new dimensions look like? What might they be like? The problem is that the human brain is able to comprehend things in three dimensions but not beyond, so we can't even start to imagine what these other dimensions are like. If we think hard about it, we can't even draw a fifth or sixth dimension, and to many people it intuitively makes no sense to think of anything beyond three dimensions. It's as if we're living in a small threedimensional enclave in a multidimensional universe, and so what we can perceive is sufficient to make sense of our own enclave but not beyond. An analogy is some of the smaller simpler organisms such as amoebae or earthworms living in the earth, who have just enough senses to detect as much of the world as they need to exist, to feed themselves, rest, and escape from predators. For them, reality is confined to their limited world. They will never know the millions of life forms that exist on Earth, even though they live there, too. The only reality that they understand is what they can detect in the small enclave in which they live.

In her book, Professor Randall discusses these limitations and uses a number of examples to illustrate the difficulties that we have in perceiving a multidimensional reality. A very good example that she uses is one that was provided in a fictional book originally published in 1884 by the British writer and scholar Edwin A. Abbott. This novel, *Flatland: A Romance of Many Dimensions,* takes place in a fictitious two-dimensional universe where two-dimensional beings of various geometric shapes live. These "Flatlanders,"

beings who have lived their whole lives in two dimensions and believe that everything exists in a two-dimensional world, are shocked by the suggestion that there could possibly be three dimensions. Everyone in Flatland knows that the universe cannot possibly be more than two dimensions! But then one character, A Square, is introduced to the reality of a third dimension when he watches a three-dimensional sphere travel vertically through his world. Because he is confined to two dimensions, however, he cannot fathom what a three-dimensional sphere would look like, and instead of a sphere he sees a series of flat two-dimensional discs that start small and then increase in size, reach a peak, and then decrease in size until they disappear. It is not until he leaves Flatland and enters a three-dimensional world, Spaceland, that he sees a sphere for what it really is and fully understands its reality. Interestingly, even an inhabitant of Spaceland goes into a fit of rage at being asked to contemplate four dimensions!

The Story of Plato's Cave Dwellers

One final example that illustrates not only the limitations of our understanding of reality but also how society gives meaning and reality to events is from Plato, the Greek philosopher. Plato believed in a concept he called the world of ideas. His view was that behind all the natural phenomena of the world there lay another reality, one from which our realities were molded. So a horse looked like horse because it was molded from the eternal and immutable pattern of a horse. This was why all horses looked like horses, even ones that were old and lame.

In order to explain this better, Plato related a myth that illustrated his idea. There are more or less detailed versions of this story, but in his book *Sophie's World*, Jostein Garrder relates it very succinctly and nicely:

> Imagine some people living in an underground cave (all their lives). They sit with their backs to the mouth of the cave with their hands and feet bound in such a way that they can only look at the back wall of the cave. Behind them is a high wall, and behind that wall pass human-like creatures, holding up various figures above the top of the wall. Because there is a fire behind these figures, they cast flickering shadows on the back wall of the cave. So the only thing the cave dwellers can see is this shadow play. They have been sitting in this position since they were born, so they think these shadows are all there are.
>
> Imagine now that one of the cave dwellers manages to free himself from his bonds. The first

thing he asks himself is where all these shadows on the cave wall come from. What do you think happens when he turns around and sees the figures being held up above the wall? To begin with he is dazzled by the sharp sunlight. He is also dazzled by the clarity of the figures because until now he has only seen their shadow. If he manages to climb over the wall and get past the fire into the world outside, he will be even more dazzled. But after rubbing his eyes he will be struck by the beauty of everything. For the first time he will see colours and clear shapes. He will see the real animals and flowers that the cave shadows were only poor reflections of. But even now he will ask himself where all the animals and flowers come from. Then he will see the sun in the sky, and realise that this is what gives life to these flowers and animals, just as the fire made the shadows visible.

The joyful cave dweller could now go skipping away into the countryside, delighting in his new-found freedom. But instead he thinks of all the others who are still down in the cave. He goes back. Once there, he tries to convince the cave dwellers that the shadows on the cave wall are but flickering reflections of "real" things. But they don't believe him. They point to the cave wall and say that what they see is all there is. Finally they kill him.

Plato's thought experiment clearly illustrates the limitations in comprehending and appreciating things that lie outside the confines of our body. Since the other members of the cave had never experienced any form of reality other than what they could see, they didn't even consider that it could exist.

If a limitation is inherent because of the body's physical structure or the mind's ingrained way of thinking, how can we get around it? It's very difficult to convince people to think about reality in a different way if they're unable to perceive it or they have a fixed opinion. How does one explain color to someone who has been blind from birth, or music to someone who has been deaf from birth, or taste to someone who has never tasted anything? If we explain the concept of light and sound as wavelength, or the taste of an apple as sweet and sour, this may allow an intellectual understanding to be reached, but this can never compare with the level of comprehension that comes with seeing a beautiful painting or hearing the sound of beautiful music or tasting an apple.

These examples highlight some of the limitations that we have in perceiving "true" reality based upon our three-dimensional brain and senses, so even if we were to see what it was really like to exist on a fourth dimension, explaining it to others would only be possible through our three-dimensional brain and hence, just as in Abbott's story, where a three-dimensional sphere was only appreciable in a two-dimensional world as a series of discs, a fourth or fifth or other dimension would only be expressible

in our threedimensional world in terms of common three-dimensional shapes and objects.

Due to these limitations, and according to some such as Plato himself, therefore, the best way to make ourselves aware of reality is to use reasoning, logic, and mathematics rather than to rely only on what we can perceive with our physical senses and the brain.

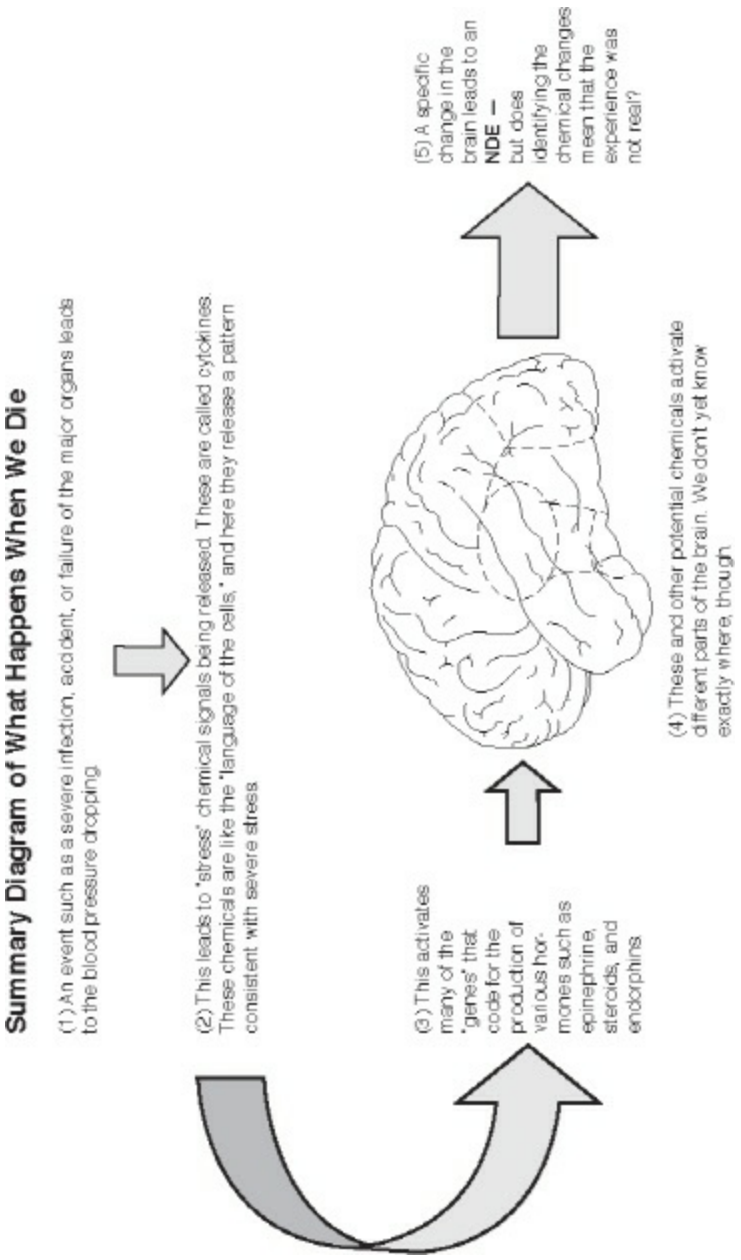
In a recent article in the journal *New Scientist,* the well-known Cambridge mathematician Professor Roger Penrose wrote:

Whether we look at the universe at the quantum scale (at the scale where things are smaller than an atom) or across the vast distances over which the effects of general relativity become clear (the vast levels of the planets and the universe itself), then the common-sense reality of chairs, tables and other material things would seem to dissolve away, to be replaced by a deeper reality inhabiting the world of mathematics. Our mathematical models of physical reality are far from complete, but they provide us with schemes that model reality with great precision—a precision enormously exceeding that of any description that is free of mathematics. There seems every reason to believe that these already remarkable schemes will be improved upon and that even more elegant and subtle pieces of mathematics will be found to mirror reality with even greater precision. . . .

Mapping the Brain: Why Isn't Reality Determined by Neurology?

Dr. Mario Beauregard is a young and vibrant scientific researcher based at the University of Montreal in Canada. I have listened to him speak on many occasions and have been very impressed with his work. Specifically, he is a neuroscientist who studies the changes that take place in the brain during various types of human experience. For many researchers like Mario, this is a fascinating new area of research that aims to determine exactly which parts of the brain are involved in the vast number of experiences that we all have. This field of study is called "brain mapping" and involves the use of special scanning devices called "functional MRI" to study the different areas of the brain that change their activity during human experience.

The principle behind this area of research lies in the fact that the brain is composed of various different areas that are activated in different ways depending on the experiences we all have. For example, when we feel happy or angry, sad or jovial, loving or bitter and, for that matter, during any and all of the range of experiences that makes us human, specific areas of the brain demonstrate changes in cell activity. So when we feel happy, cells in part A of the brain become active; and when we feel sad, cells in part B become active. By studying these changes within the brain, we can get an understanding of the areas of the brain that are responsible for specific experiences. This is what scientists such as Mario try to do, and this is why they call it “mapping the brain.”


Summary Diagram of What Happens When We Die
(1) An event such as a severe infection, accident, or failure of the major organs leads to the blood pressure dropping
(2) This leads to "stress" chemical signals being released. These are called cytokines. These chemicals are like the "language of the cells," and here they release a pattern consistent with severe stress
(3) This activates many of the "genes" that code for the production of various hormones such as epinephrine, steroids, and endorphins
(4) These and other potential chemicals activate different parts of the brain. We don't yet know exactly where, though.
(5) A specific change in the brain leads to an NDE — but does identifying the chemical changes mean that the experience was not real?

Although through this technique scientists can come to understand which areas of the brain are mediating a particular experience, the problem is that when we analyze these changes using an MRI scan or other scanning machines, we only see the activation of cells. We cannot say whether there is an external reality to the sensation that is being studied and hence whether it is real or not. If, for example, I see that while a mother holds her child an area of her brain that corresponds to “love” becomes active, I cannot determine from this whether human love is “real” or “unreal.” All that I can determine

is that cells in a specific area become active. Does that activity, which is itself a measure of electrical and chemical changes, tell us that maternal love is "real"? No, it just tells us that those cells have become activated. It is society that tells us that maternal love is "real" because it is a universal phenomenon, and we have all experienced it in some way.

In fact, many of the areas that become active when we are having a "real" experience also become active when we have an experience that may not be considered "real." For example, when someone with schizophrenia "sees" someone or "hears" a voice telling them what to do when in fact there is nobody present, many of the same areas of the brain that are involved with "seeing" and "hearing" real things become activated. So again, the changes in the cells are not what give experiences meaning. This is why my old medical-student colleague Ebby said that we cannot determine reality from the study of neuroscience or neurology. We cannot determine whether someone's experience is real or not simply by studying changes that are taking place in the brain, and this of course also applies to near-death experiences.

Reality and NDEs

As all human experience, "real" or "unreal," can be found to have at its root areas of brain activation, the fact that some researchers propose that the activation of certain brain cells may lead to a near-death experience does not mean that the experience must be a hallucination.

Many scientists have in fact debated which parts of the brain are involved in NDEs and have theorized that they may be due to brain-cell activity in the limbic or temporal lobes. What we do know is that each area of the brain processes multiple functions and that "conscious" states such as seeing, thinking, feelings, and emotions are mediated in many areas at the same time. As already mentioned, when someone is about to die, the body initially responds by releasing certain chemicals and steroids to try and maintain the blood pressure and allow sufficient blood to get to the brain. After a while, however, the blood pressure drops, and there is thus reduced blood flow to the brain, which will in turn activate certain parts of the brain and lead to the near-death experience. Although I acknowledge that we still do not know exactly which areas are involved, undoubtedly brain processes do mediate the

experience. But the discovery of the exact areas will not explain the significance of near-death experiences. Neither will it make an NDE “unreal” or a hallucination, in exactly the same way that discovering the areas of the brain involved in experiencing maternal love doesn’t make that feeling a hallucination.

In fact, the finding by the Swiss researchers who induced an out-of-body–like experience by stimulating certain areas of the brain is not new. In the 1930s, the pioneering American neurosurgeon and researcher Dr. Wilder Penfield used electricity to stimulate parts of the brain as part of his treatment of epilepsy. He noted that while stimulating the temporal lobe, one of his patients had felt that she was leaving her body.

Obviously these conclusions are based upon single-case reports of out-of-body–like sensations following electrical stimulation of the brain, and far more research is needed before definitive conclusions can be made. Also, although these isolated cases are fascinating, there have been many others where stimulation of that exact area of the brain did not induce these sensations. The Swiss doctors themselves were quite surprised by their finding, as they and other doctors who perform that particular procedure had stimulated those areas of the brain many times before. No one knows why that particular woman had that particular experience. Nevertheless, it is obvious that an area of the brain mediates outof-body experiences, and this could be it.

Interestingly, although out-of-body experiences have been reported with NDEs, they can also occur in isolation and in response to very different stimuli, including severe anxiety, pain, and even deep relaxation. Therefore, it may be that the area of the brain that becomes activated during a close encounter with death can also become active in response to different stimuli.

During out-of-body experiences, people have “seen” events taking place, and in many cases others have confirmed these details. Obviously, if out-of-body experiences are simply illusions, then no verifiable events should be witnessed and independently confirmed. This is particularly the case with cardiac-arrest patients, where there is severe impairment of brain function. So again, simply identifying the areas of the brain mediating an experience doesn’t explain the meaning of that experience or indicate that it is in any way an illusion.

Therefore, I realized that we cannot objectively say that the out-of-body

experience is not real. We simply don't know. The only way to know is to conduct objective studies and not to allow our own socially formed prejudices to sway our interpretation of the data. This is particularly important for scientists studying the phenomenon. We surely need to keep an open mind and accept the results of appropriately designed studies.

The only aspect of the near-death experience that can be objectively tested, validated, and studied in the context of whether it is real or not is in fact the out-of-body component. This is because people who have had an out-of-body experience can often tell us what we have done during a time when in many cases they should not have brain function present. The rest of the near-death experience is a very personal experience for the individual, and we have no way of determining whether there is an external reality that corresponds to it. In fact, determining the reality of the near-death experience (other than the out-of-body component) has many of the same limitations as those faced by scientists studying religious experience.

Are Religious Experiences Real?

For many who have had an NDE, the experience has had a profoundly religious effect on them, changed their outlook, and led them to live a more altruistic, less materialistic life. Perhaps, in order to understand NDEs better, we need to understand religious experiences better. Many people have in fact likened NDEs to religious experiences.

Although the scientific study of religious experience is still in its infancy, there has certainly been some progress in this area in the last 30 years. Dr. Andrew Newberg, a radiology professor and neurological imaging specialist at the University of Pennsylvania, is a leading figure in the study of the brain biology (neurobiology) of religious experiences. He has used high-tech imaging techniques to observe changes in brain function that occur during meditation and deep prayer. It is thought that his work may ultimately help to show how our minds move beyond the self and open to the divine. In his book *Why God Won't Go Away* and numerous scientific publications, Newberg has described the results of experiments that he and others have carried out. These have demonstrated that prayerful meditation is correlated with a quieting of activity and reduction in blood flow in the posterior

superior parietal lobe, an area that lies toward the middle of the brain and is normally responsible for providing us with our sense of orientation. This may indicate how the person meditating is experiencing oneness with the “sacred” and a loss of boundaries of the self. Studies have also demonstrated that the frontal and temporal areas of the brain become active during meditation.

At the same time, various chemical changes have been shown to take place in the blood. There is an increase in melatonin and serotonin levels and a reduction in cortisol (a steroid hormone) and epinephrine levels. This makes sense, as the former two hormones are involved in relaxation, whereas the latter two are increased during physical stress.

During an interview with a magazine, Professor Newberg was asked whether the experiences of people meditating were externally real or not. He explained that scientifically proving the religious reality of his studies might not be possible: “While I think we have provided the most comprehensive neurological model of meditation and prayer to date, I can’t prove or disprove that when somebody connects with God, he or she has actually connected. My publisher originally wanted me to call this a ‘real’ experience—which we have no way of proving. Eventually, we compromised with the term ‘neurologically real,’ and we are in fact seeing something that is real from that perspective.”

Ultimately, I realized, all that we experience, including religious experiences and NDEs, is mediated by the brain. Undoubtedly we will one day discover the molecular mediators of religious experiences and NDEs and also the exact areas of the brain that mediate them, but this will only tell us which parts of the brain are involved in the experiences, not whether the experiences are real.

Our brain and our senses limit our ability to determine what is truly real. Therefore, we have to move away from thinking about whether NDEs are real or not. We do not have the physical senses to determine whether there is an external reality beyond what we can perceive, and we have not yet developed the scientific instruments that will allow us to determine this objectively.

As my colleague Dr. Ebby, who has always been extremely rational, says: “Neuroscience cannot tell us whether or not there is an ‘external reality’ behind the reports of near-death experiences and as such we simply do not know. The experiences are certainly ‘real’ for the individuals who have

experienced them, but that is all that we can say at this point. In the same way, we can also not refute the experiencer's claims either, since we haven't had the experience."

The other limitation is that even if we assume for a moment that when people have died they have indeed experienced a different reality, perhaps a different dimension beyond our everyday three-dimensional world, and this is what they are trying to explain to us, nevertheless by virtue of the fact that when they return back to life and have to explain it to others they have to use our common everyday language and threedimensional expressions, they lose some of the meaning.

It's like someone who goes from the two-dimensional Flatland to the three-dimensional Spaceland in Abbott's book *Flatland* and experiences something completely new and then has to return back to the two-dimensional world and explain it to others. Just as the character in Abbott's book can no longer explain what it's like to see a sphere and can only talk in terms of two-dimensional discs of differing sizes, it may be that if these people have experienced something of an external reality beyond our familiar three-dimensional world, they can no longer truly explain what they have experienced. This may also be a reason why they also often use common three-dimensional descriptions such as going through a tunnel.

At any rate, for now, we cannot scientifically determine whether or not there is an external reality behind the experiences.

❑❑❑❑❑❑

CHAPTER EIGHT

THE HORIZON

Except for a few clouds on the horizon, there was blue sky all the way ahead. As I stared at it, for a moment I occupied myself with my own thoughts. This was almost how I saw our project. Although there were some clouds ahead, I felt confident that the sky would clear. *We'll see*, I thought to myself. *Now I wonder where we are?*

I glanced down at the map and then looked below to see if I could find the town that we were passing over. *That must be it … I wonder if we're in Switzerland now?* I certainly hoped so! I had spent almost six hours in a little propeller plane with Peter Fenwick, who was flying my team and me to meet members of the Gerontological Economic Research Organisation (GERO), a German/Swiss charity. They had shown interest in our work and had invited us to their headquarters in Kreuzlingen, a small town outside Zurich, to see whether they could help us raise funds for the second stage of our research project.

This trip was one of many attempts that I made to raise funds to build on our pilot study and conduct the first-ever large-scale study of NDEs in cardiac arrest in the world. I hoped that this would be the definitive study needed to investigate the outcome of the human mind and consciousness at the end of life.

By this time I had not only graduated from medical school, I had also completed four years of postgraduate clinical training in internal medicine and had also passed the very difficult final postgraduate (MRCP) examination. The MRCP title is the internationally accepted benchmark that indicates proficiency in internal medicine. Having obtained this prestigious qualification, I had decided to take time out of purely clinical practice to start a Ph.D. in cell biology. I wanted to become proficient in this field and had

decided to combine a career in medical research with clinical medicine as a respiratory and critical care specialist. I knew this meant that during the next three years I would have to give up most of my spare time. Since I had to work on my Ph.D. during the day as well as see patients in the clinic and work long overnight shifts on call in hospital, I would essentially be left with just a few hours free in the evenings and some weekends. Nevertheless, I thought it was worth it.

Since I had been so drawn to the study of the human mind and consciousness during clinical death, I really wanted to solve the mystery once and for all. This was especially interesting to me as a critical care physician. I couldn't just abandon it. I also realized that a Ph.D. leading to proficiency in cell biology and research methodology would not only make me into a better doctor but also help me accomplish this particular aim.

I was working under Professor Stephen Holgate, who was one of the most respected leaders in the field of pulmonary medicine. He had a worldwide reputation for excellence and had been approached for the post of chief medical officer in the UK and also chief of pulmonary medicine at Harvard Medical School in the U.S. I also worked under Professor Donna Davies, an accomplished and highly experienced researcher with an immense knowledge of cell biology; and Professor Anthony Frew, an expert on asthma and allergic disorders.

Stephen Holgate was an extremely kind and approachable man. He had a genuine way with people, and everybody both respected and admired him. He was also altruistic. After I started working in his department, he enthusiastically agreed to support my proposed study examining the state of the human mind and consciousness during cardiac arrest as well the subject of my Ph.D., which was in the field of lung cell biology.

This time we couldn't do the study on just a shoestring budget, so we needed to apply for a research fund. It all seemed simple—we would raise the necessary funds in the first year and then concentrate on doing the study in the next two years. Based upon our pilot study in Southampton, I calculated that we would need to study approximately 1,500 cardiac-arrest survivors, and in order to complete the study in two years would need to recruit at least 25 hospitals to help with it. I hoped that once we had raised the funds we could recruit staff, in particular research nurses to work under my supervision. This way I would be able to spend more time on my Ph.D.

(which, after all, was on a completely separate subject!), especially in the second and third years when it was going to get tougher, and still complete the project on the dying process. I knew this was an ambitious plan, but I thought it was worth trying.

Being relatively new to the field of research, however, I hadn't quite appreciated the enormity of the challenge of getting funding. This is the minefield facing all researchers and the main reason why many doctors and scientists either do not pursue a career in research or give it up after a while and follow a different career path, perhaps working in private practice or for pharmaceutical companies. I came to realize this later, but back then, rather naïvely, I joined the chorus of researchers looking for funding for their projects.

In early 2000 I worked with Dr. Peter Fenwick, Dr. Derek Waller, and Professor Stephen Holgate to submit our first grant application for funding. We decided to apply to a charity that was one of the biggest and best-known medical funding bodies in the UK, and in fact the biggest private medical charity in the world. Among their portfolio of research projects was support for the human genome project. At that time they had a grant available that was designed to support high-risk yet novel and innovative studies, and I felt confident that they would fund ours. This confidence stemmed from the fact that it was both novel and innovative and had never been attempted anywhere in the world. In addition, we were investigating a really new area of medicine that was not only fascinating but also very exciting.

To my delight (and really pretty much as I had hoped!), our application was received warmly by the charity. I was told over the telephone that during their assessment the committee had looked at it very favorably and that pending a few questions, it would be approved. It was commonplace and certainly nothing unusual for a committee to raise a few questions before a final approval.

The application had also been sent out to other scientists for review, and they too had responded positively. This is the standard way that applications are assessed. The grant-giving body initially assesses the merits of an application, and if they deem it worthy of funding, then they send it out to three or four people with expertise in that field and ask for their critical reviews. This is called an "external peer-review process," and if the experts also respond favorably, the grant-giving body then makes a decision about

whether or not to fund the study.

In our case, we seemed to be on track, as our application had been positively reviewed at every step, and we were even told over the phone that pending a few formalities we would receive written confirmation of the grant being approved within the next few weeks. This didn't seem all that difficult, and in fact the whole thing had only taken a few months! It had gone so smoothly that while waiting I started planning the practicalities of conducting the study. I organized a meeting and invited the resuscitation departments of six or seven hospitals based in the south of England (our local hospitals) to attend. Following the meeting, they all agreed to participate in the study, so we decided to take it further once we received our grant.

Bizarrely, and rather frustratingly, however, it took almost six months for the committee's questions (regarding the "few formalities") to be sent to us. This was a very straightforward and standard procedure, so why was it taking so long? I was eager to start, so during these months I contacted the charity on numerous occasions, only to be told that the matter was being dealt with and that the application had gone to various different offices for review.

After waiting for months, eventually we were told that in fact the charity wanted us to remove the proposal to place hidden targets in the resuscitation rooms. I was told that the concept of testing people's claims of being "out of body" was unacceptable to them. This was a very unexpected response and completely took me by surprise—after all, the study methods had been clear, and the need to use the hidden targets was also quite clear. And the whole point was to test the claims of being able to see things—how could we do the study without it?

Peter Fenwick and I grappled with this for weeks and decided in the end that we would still do the study but in two components, one that involved the hidden targets and one that did not. We would then make it clear that the component with the targets had not been supported by that particular organization. This way we would still do our study but not involve the charity for the component that they felt unwilling to support.

By now it was becoming clear that there were discussions going on behind the scenes that were affecting whether or not we would receive the funds. But we had agreed to the very difficult condition that had suddenly been imposed upon us and had made all the requested amendments to the proposal. However, after an acknowledgment letter, yet again months went by with no

specific reply. There really was something wrong! We had complied with all the charity's wishes, but still there was no sign of the money.

During this time I often spoke with the administrative staff who dealt with these applications, but they kept on saying that ours had gone to yet another desk or was now with a senior member of the charity. Then, after more than 18 months, our application was completely rejected! In the final letter, no real reason was given, but just before we received it, I managed to speak to the scientific director in charge of the program, and he actually told me that the charity was concerned that NDE research might have a negative impact on their organization in the press and that they wouldn't be able to support it for this reason. He also suggested that I should not pursue this type of research myself, as it would not be good for my career.

I was really disappointed by the way that we had been treated. This really wasn't the right way to do things in academic circles. There had been no problems with the scientific reviews by experts. I knew that our reviewers included someone who was generally very skeptical of this type of research, but even she had supported it, so why had the charity taken this negative view? I was really very disappointed indeed, but now there wasn't much I could do about it. So I learned a hard lesson—that there were still biased views out there that could not easily be overcome.

The other problem was that it had been a long wait to get the reply. If the charity had just rejected it at the beginning, then I wouldn't have minded so much, but now we had lost 18 months waiting for a decision. I was also annoyed, as I felt the project wasn't being rejected on scientific grounds but simply due to prejudice. In addition, unfortunately for us, research etiquette meant that while waiting to hear from this grant-giving body, we were not allowed to apply anywhere else. Feeling completely let down, I now had to abandon all plans to start the research and go back to the drawing board. I felt awful.

Soon afterward, I started looking for alternative sources of funding, but it wasn't easy. Normally when scientists want to fund a study, they have to apply to a medical charity that has a permit to fund research in that area. There were charities for cancer care, heart disease, lung disease, diabetes, and so on—everything, really, except NDEs. Not only this, but very few charities were interested in the subject of death and dying, and those that were either had no research budget or a very limited one.

Although our first application had been to a major charity with a specific grant designed to fund innovative, novel, yet high-risk, or what was commonly termed “blue sky” research, this was an exception, as most medical charities only funded well-established “low-risk” projects. They had adopted this strategy in recent times in order to maximize the use of donations. Although this was positive in many ways, there was also a downside, and many people like myself had experienced it. Much of scientific progress had come through blue-sky research projects, and this new strategy would stifle researchers with untested ideas. However, I couldn’t change the system—I just had to work with it.

Then I had an idea. There were obviously many people who had either had a near-death experience or were interested in them, but there were no charities that funded research in the subject. So why not try to establish a charity ourselves? I had seen how many medical research departments, including Stephen Holgate’s, had set up their own local charities, so why couldn’t we do that? Also, I noticed that many charities donated money to other charities and not directly to individuals or projects. This way anybody who was interested would be able to make donations, and we could also perhaps liaise with other charities to fund NDE research. Maybe we could not only fund our own study but also become a source of funding for other people who wanted to research the study of death.

When I spoke to Peter about it, he told me that in the 1980s he and a few others had set up a charity together that had now become completely dormant. “Why don’t you take it over and reactivate it?” he said. So I did, and renamed it the Horizon Research Foundation.

There was a real need for a charity like Horizon, as there were many people who’d had NDEs and had nowhere to turn to for help in the UK. Many felt isolated and could not easily discuss their experiences without fear of being considered insane! Now they had a portal to turn to. It became a very exciting time for us indeed. We created a new logo and started working on establishing a newsletter and membership apparatus.

We eventually had a great team of volunteers all working together. The person who carried the biggest workload was Heather Sloan, a real angel who helped me so much with my NDE work. We’d met when she’d written to me about her own NDE, and I had invited her in for an interview. Eventually she took on a large portion of the responsibility for Horizon, managing the office

and all our administration, as well as speaking to all the people who contacted us with NDEs. She was very kind and had a wonderful rapport with people and really comforted those who'd had traumatic experiences. She worked entirely selflessly, and I grew to admire her more and more as time went by. Also, on days when there was a story about our work in the media, she would get others in to take calls. Soon after we'd set up Horizon, I appeared on the morning program GMTV, and we were inundated with calls. Luckily, Heather had gotten a team ready to take them all!

The rest of our team of volunteers included Cassie Wilcox, a very creative writer who helped with the production of our newsletters; Giti Amirani, a young dynamic Oxford graduate with excellent experience working with charities; and Brenda North, who worked with the pharmaceutical industry. They all helped tremendously, and worked tirelessly with affection and enthusiasm. I felt honored. We really had a great team.

We deliberately decided to keep the membership costs of Horizon as low as possible, so as not to deprive those who could not afford to pay a lot. We charged £10 per year (about $17 U.S.), which gave members four newsletters annually and also a discount on any events. The newsletters provided light-hearted news about NDEs and also any other interesting news, as well as an update on our progress with the study. We also organized an annual conference where we could update people on the latest progress in NDE research. The first was held in Southampton in the autumn of 2001 and the second was held a year later in London. We had a great turnout, and on both occasions the lecture theaters were full.

Amazingly, Heather and I organized the first one together. For the second conference, we had more help, as by then we had been joined by Giti, Cassie, and Brenda. We all worked extremely hard to organize these conferences, and Giti in particular did a great job with PR. She got our conference covered in *The Times* as well as on *Breakfast,* the morning news program on BBC1. Many other reports followed, including one in *The Australian* newspaper.

During these years, I traveled around the country giving talks to other doctors. These were sponsored by a pharmaceutical company and had two benefits: first, they made doctors more aware of NDEs; and second, they provided a funding stream for Horizon through the speaker's fees, which I donated to the charity.

In 2001 I was also invited to give a lecture by Dr. Lili Feng, a researcher at

the prestigious Baylor College of Medicine in Houston, who was studying the changes that take place in human genes in response to disease. She had also become quite eager to study the changes that take place in response to changes in the mind, including near-death experiences.

During that trip, I went on a lecture tour that took me to UCLA and Caltech (the California Institute of Technology), both in Los Angeles; and the Harvard Science Center in Boston. The title of my lecture was “Near-Death Experiences in Cardiac Arrest: Visions of a Dying Brain or Visions of a New Science of Consciousness?” At Caltech there was a large scientific group interested in the problem of consciousness, and although I’d been invited by the biological sciences department, a large number of students and faculty from the consciousness group also came to the lecture. This was the most stimulating session I’d ever had, as these people were very interested in the problem of consciousness and were in fact at the cutting edge of studying the neural correlates of consciousness, so their questions were very interesting!

The organizers at Caltech had also sent out a press release about the event, and during my short trip to Los Angeles I was interviewed by Sarah Tippit, a reporter for Reuters news agency. Her report was released globally, so overnight, reports of our work appeared in places as far away as Hungary, Turkey, China, and India. One of my closest friends told me that his father had even seen us on the front cover of a newspaper in Nigeria!

Near-death experiences were certainly very popular all over the world—there was no doubt about that. When I had first started my research, I hadn’t expected people to be so drawn to it, but I could see now that there was truly global interest in the subject.

❑❑❑

’Ere, Norm! You had one of them near-death experiences once, didn’t you?

I also found this cartoon that appeared in the *Daily Mail* very amusing! I really enjoyed the lighthearted approach that some cartoonists had taken to the subject of near-death experiences.

(*Source:* Reproduced by kind permission of Solo Syndication.)

I had experienced my first taste of this a year earlier when I’d been waiting to get the results of our Southampton study published in the medical journal *Resuscitation.* Then I had been contacted by Jonathan Petre, a journalist working for the *Sunday Telegraph* in London, who had asked about our study. When he’d found out that no one had yet reported our results, he had excitedly asked me to let him have an exclusive interview. The following week, when his article was published, there was a surge of telephone calls from members of the press both to work and to the university press office. I had not been expecting this and was actually away from work at the time. So I spent that entire week giving interviews, either via satellite link to Australia and Canada, where we had been on the front page of the newspapers, or in person. I also had a team from RAI, the Italian television network, visit me, and since the reporter was an avid soccer fan, we also shared our love of the sport!

On the day that Reuters released news of our study, their article was the

number one article on Yahoo! in terms of hits and the number of times it was copied and e-mailed to others. There were also more than 500 posts to the Yahoo! Website; and the BBC in conjunction with the Discovery Channel contacted me to ask me to help with the production of a new documentary called *The Day I Died.*

Despite the global, public, and media interest, however, we still hadn't managed to get the second stage of our research funded. Also, although the work of Horizon was a great success, it was extremely time-consuming for me. Even though we had a great team, I still had to input a lot of the materials. Our second conference had taken four months to organize, and it was getting very hard for me to cope with all the work I had to do. I had a very limited amount of spare time, and I still had to try and raise funds for the NDE study. Unfortunately, I couldn't delegate this to anyone else, as it needed scientific writing. My other problem was that the pressure with my thesis was also building up. I had only 18 months left, and if I wanted to succeed, I had to spend many of my evenings and weekends working in the lab. It was getting to the point where I would have to decide between my Ph.D. and Horizon.

By early 2003 we had managed to raise some funds through Horizon, but only very modest amounts indeed. Also, Heather's personal circumstances had changed. Her husband had become quite ill and so had her elderly mother. She would get home from work and have to attend to them as well as do her work for Horizon, and it was wearing her out. When we had started, we had hoped that we could raise enough money to employ an administrator and a fund raiser, but the reality was that we couldn't. And now, reluctantly, Heather and I had to face the fact that neither of us could dedicate so much time to Horizon. We decided to complete one year's newsletters, so that those who had paid would get their money's worth, and then not take anybody else's money. We would have to slowly cease activity with Horizon until our circumstances changed.

During those three years, I had worked very hard at raising funds for the NDE research and had applied to many organiza- tions, but with little success. The problem was really that there were no organizations with funds available that were interested in funding research into the dying process. More often than not, the feedback was that although interesting, this wasn't an area that they were looking to fund. I could understand their position—

they had to fund what lay in their own purview.

Despite the many unsuccessful attempts to raise the funds needed for the larger study, however, we had made some real progress in understanding more about what happened when we died. We had been the first group to relate near-death experiences during cardiac arrest to the study of consciousness, and to highlight the important changes that took place in the brain during cardiac arrest. I had written a scientific article about this, together with Peter Fenwick, for the medical journal *Resuscitation* in 2002.

There was also definite medical interest in the subject. According to the journal, our article was one of the most popular that year. I had managed to form a scientific group to study consciousness at the University of Southampton (comprised of me, Dr .Peter Fenwick, Professor Robert Peveler from the Department of Psychiatry, and Professor Stephen Holgate) and had been invited to give a number of lectures in the UK, including for the Resuscitation Council, the Intensive Care Society, and the British Psychological Society. I had also become a reviewer on the subject for the *New England Journal of Medicine,* one of the most prestigious medical journals in the world.

In addition to the academic world, interest in our work had also trickled down to schools. In fact, one of the most heartwarming moments for me during that whole period was when Paul, the 16-year-old son of one of my friends, told me that he and his classmates had been taught about our work at school. They had also been shown a video of the BBC documentary *The Day I Died.* Later on I found out that our work was being included in the latest edition of an educational textbook for schoolchildren. The fact that it was being taught to our youngsters really gave me a sense of great happiness.

RESEARCH ON THE HORIZON

In spite of the relative successes, it certainly seemed that as far as funding was concerned, all the doors were slammed shut tight, and it looked as if I would perhaps never succeed in getting the funds necessary to start a comprehensive study. Despite these setbacks, though, I was convinced that I just had to persevere, try my best, and wait to see if a door would eventually open.

Sure enough, the break I was looking for came eventually. After my lecture at the Resuscitation Council annual conference in London, some of the members of the Resuscitation Council Committee came up to me very excitedly and suggested that I apply to the council for funding of my bigger study. They did warn me that they only provided very limited budgets, as they preferred to provide many small grants rather than few large grants, but said that at least it would be a start. So I applied, and finally, after almost three years of trying to raise funds, I was awarded a small grant of £10,000 (about $17,000 U.S.) from the Resuscitation Council to start a new study of consciousness and the human mind during cardiac arrest.

The Resuscitation Council is the chief scientific organization responsible for education as well as research into cardiac arrest resuscitation in the UK, and is closely allied with the European Resuscitation Council. It trains all the doctors, nurses, and paramedics working in the UK to provide cardiac-arrest resuscitation. Although the sum of money that it had offered had not been huge, this was the first time that a major scientific funding organization had reviewed our study and supported the work as a valid scientific study.

Realizing that this was a brand new and somewhat experimental field, the Resuscitation Council had preferred to fund a smaller study involving perhaps five or six centers and then assess the results. My opinion, based upon the results of our own pilot study and the other studies of cardiac arrest, had been that it would be best to perform this study on a much larger scale, otherwise we still risked having a study that would be inconclusive. However, the Resuscitation Council had also agreed to have other organizations partly fund the study, so we also used the funds that were available in the Horizon account. This way we doubled our research fund to around £20,000.

We had initially sought to raise over £140,000 (about $248,000 U.S.) to recruit three full-time research nurses to help us enroll over 1,500 cardiac arrest survivors in two years. Our aim had been to determine exactly what happened to the human mind and consciousness during clinical death and its relation to the brain. Now we had less funding, so we had to scale back and try and build up slowly. The first thing that had gone had been the ability to actually employ anyone full-time for this study. We didn’t have enough money to pay for even a single research nurse, but at least we did have enough to pay for the costs of setting up a smaller version of the study.

It had taken so long to get any money to do the study that by the time I did have some cash, my own personal circumstances had changed. I had originally hoped to start the study right at the beginning of my Ph.D. project, around 2000 or 2001 at the latest. Then I'd had more time, but now we were in 2003, and I was under a lot of pressure to complete my experiments and write up my Ph.D. thesis. I also had a new clinical job starting at Hammersmith Hospital in London, so I really had to complete my Ph.D. first. So ironically, having now obtained the grant, I sadly had to delay any attempts to start the study.

I often wondered what would have happened if our larger study had been funded three years earlier. The potential had been immense, but I couldn't dwell on it too much. I had tried my best, but it hadn't quite worked out as I had hoped. We would just have to try to make do with what we had.

Where Are We Today?

It has taken many years, but eventually in January 2007, the first phase of our long-awaited study started at two hospital sites in and around London. The aim had become to start on a small scale and then build up into the largest-ever study of the human mind, brain, and consciousness during clinical death. As I write, in July 2007, these two sites have been joined by another three hospitals, and within the next few months I expect that we will be up to 15 hospitals. Our ultimate aim is to recruit 30 centers across the UK by the end of 2007. Ideally, we would also like to do this study in other countries, but for the time being I've had to concentrate on recruiting all the centers needed in the UK.

In the last few years we have built up a worldwide collaboration, and we are continuing this further. Dr. Peter Fenwick and I were joined in 2004 by Ken Spearpoint, a very bright and knowledgeable senior resuscitation officer based at Hammersmith Hospital in London. A year earlier, while still at the University of Southampton, we had formed the Consciousness Research Group with Professor Stephen Holgate and Professor Robert Peveler (psychiatry). Today our network includes those pivotal people together with Professor Bruce Greyson (psychiatry) from the University of Virginia; Dr. Mario Beauregard (neuroscience) from the University of Montreal; Professor

Jan Holden (counseling) from the University of Texas; Dr. Penny Sartori (critical care nursing), Morriston Hospital, UK; and Salli Lovett (critical care nursing) Stevenage Hospital, UK; as well as the following people who all work in the field of resuscitation within the UK: Niki Fallowfield, Southampton General Hospital; Susan Jones, Addenbrookes Hospital/ University of Cambridge; Celia Warlow, Northampton General Hospital; Leanne Smythe and Paula McLean, St George's Hospital, University of London; Paul Wills and Laura Wilkins, St Peter's Hospital; Russell Metcalfe Smith, Mayday Hospital, London; Hayley Killingback, Royal Bournemouth Hospital; Sue Collins, Bedford Hospital; and Julie Dowding, Dorchester Hospital.

I have to emphasize that although things look very promising, both in terms of the collaboration and the study, which continues to expand, we are very much at the beginning of the process and not the end. The past six months have been spent trying to iron out any potential teething problems before we start recruiting patients on a large scale. I thus apologize to anyone who anticipated seeing the results of this study in this book, but we will be unable to release the results until the study has concluded.

When I completed the first edition of this book, in mid-2005, I had not even managed to start this large multi-center study. Although confident that I would do so, I purposefully downplayed this, as there were so many potential hurdles that I did not want to say anything until I was sure it would start. Many people who read the book have expressed disappointment at not knowing what would happen in the end. Although I can now say that the study looks to be well under way and we have started recruiting patients, we will not have the results probably for at least another two and perhaps three years, perhaps even longer, and so we still don't know.

It has actually taken almost two years just to get to a point where we can start. Just to give you an idea of the potential hurdles that slow us down or even stop us, I can say that numerous pieces of paperwork arise once a hospital asks to join the study. These come from various areas such as the internal resuscitation committee; the research and development office; the ethics, infection control, and hospital management offices; works and estates; and so on. Each of these offices has to issue their own approval, and anyone who has ever had to deal with numerous different offices in a private or public organization will understand what this means! Invariably it takes quite

a long time (at least three to nine months per site and sometimes longer), and many of the sites that initially show interest or agree to participate actually do not manage to do so.

Research is a very slow process and, as already mentioned, we simply do not know what the outcome of our study will be. I can only promise to be faithful to the results as and when they become available. I think it is nevertheless important for people to realize that there is a new field of objective and mainstream scientific study of clinical death that may revolutionize our understanding of life and death in the very near future. This is something that has never been done before in the history of humankind and is in itself very significant.

Future Plans

At a recent meeting attended by many of our scientific collaborative group, we discussed in detail a proposed long-term initiative. The study that we have started across the UK and are currently expanding is the first of many planned studies. I think of it more as a ten-year plan to study human consciousness, the mind, and brain during clinical death. Obviously we hope that we will be able to obtain financial support for this new initiative, and in fact one of the aims of this meeting was to look at ways of funding the collaboration.

At the meeting, we summarized the scientific findings so far. Putting it all together now, we know that for years there have been anecdotal cases of people who have reported lucid thought processes and conscious awareness, including an ability to see and hear things from a time when they have been in a cardiac arrest, or in other words, clinical death.

Interestingly, in addition to these anecdotal reports, the results of published scientific studies of NDE during cardiac arrest since 2001 have indicated that around 10 to 20 percent of cardiac-arrest survivors report lucid well-structured thought processes, reasoning, memories, and sometimes detailed recall of their cardiac arrest. (Most recall experiences that are similar to near-death experiences, and some recall watching their own resuscitation.) In other words, their mind and consciousness are working during cardiac arrest.

It is not clear yet whether only 10 to 20 percent have these experiences or

whether the majority of people, or perhaps everyone, does so but only a proportion is able to recall it when asked after the cardiac arrest. This could possibly be the case, especially if there is a breakdown at the mind–brain interface. Our inability to recall dreams is a good example of this. We know that we all dream, but somehow we can only recall a small percentage of our dreams, and it is not clear why some people recall more than others and what factors enable us to do so. The fact that we can't recall our dreams, however, does not mean that we don't dream. Scientifically speaking, it would make a lot of sense for most people not to recall their experiences from cardiac arrest, as the brain is so dysfunctional in this state that it should not be able to set down any memories, and yet at least 10 to 20 percent of people do recall these experiences.

We do not know how this happens, but we do know for certain that having these experiences implies that these people have activity of the mind and consciousness during cardiac arrest. What is really interesting is that separate studies carried out by completely different groups of scientific researchers have consistently shown that (perhaps as expected) brain function ceases during cardiac arrest (clinical death). This has paradoxically raised the (not-soinsignificant) possibility that the human mind and consciousness may continue to function during cardiac arrest—that is, when the brain is not functioning and when the clinical criteria of death have been met.

So, in essence, today there are two sets of data available that when put together become very significant. One suggests that the human mind and consciousness can continue functioning during cardiac arrest and hence during clinical death, while the other states that the human brain itself does not function during this time. This happens because despite the best available medical care, we are still unable to get adequate blood flowing to the brain during cardiac arrest. If both of these sets of data are absolutely correct, then this would suggest that the human mind and consciousness continue to function even when the brain does not work and when we have reached clinical death. This would then imply that many of our assumptions about the relationship between the brain and the mind are not correct. For example, it would be hard to argue that mind and consciousness are simply products of electrical and chemical activity (as currently many of us have assumed they are) arising from the brain, since during cardiac arrest there is no measurable electrical activity and any chemical changes are geared to saving individual

brain cells from imminent selfregulated death (apoptosis). Cells, thus, are not able to communicate together coherently as they do under normal conditions.

What also of the arguments made by people like Dr. Stuart Hameroff? How do organisms without a brain like ours, such as worms, or those with no brain cells at all, such as amoebae, learn, develop memories, obtain food, and avoid predators? Do they not have consciousness? Maybe it is not the relatively gross level of brain cell activity that forms consciousness, but another mechanism, one that we have not yet discovered. Perhaps human consciousness is itself a separate scientific entity similar to other types of subtle "matter" such as electromagnetic waves, as described by Professor Bahram Elahi.

The key is thus to see whether these two sets of data can actually be merged together in the individual cases where people report being able to see and hear things during a cardiac arrest without proper blood flow to the brain, and hence no measurable brain function. Such a confirmed observation would essentially prove this startling possibility to be true.

Alternatively, could it be that there is something else going on that may be explained through more conventional neuroscientific and psychological means? Perhaps, in fact, people do not actually "see" things from above as they believe during cardiac arrest but are either "seeing" by opening their eyes or are forming "false memories" after their brain has recovered.

Furthermore, even though many studies have demonstrated that there is inadequate blood flow to the brain during cardiac arrest and therefore measurable human brain function ceases, can we be sure that a small proportion of people do not somehow have better blood flow and hence brain activity? This may be why a small proportion of people retain consciousness while others do not.

Alternatively, these experiences may actually be "false memories"—in effect, memories that have formed after the brain has recovered from the cardiac arrest, but before the person has actually come out of the coma, thus making them believe that they had truly seen what they had described during cardiac arrest, although in fact it had been nothing more than an illusion.

Therefore, the aim of the study is to better understand the mechanisms leading to conscious awareness during cardiac arrest and to test all the above possibilities in order to determine once and for all what happens to the human mind and consciousness during clinical death. As part of this study, local

investigators will identify cardiac-arrest survivors and interview them regarding any experiences that they may have had. They will also be collecting data regarding the patients' specific biological details, such as their oxygen and carbon dioxide levels from the time of cardiac arrest. This way we can determine if there is a relationship between changes in oxygen and carbon dioxide and having an NDE, as well as testing the possibility that NDEs occur as a consequence of lack of oxygen. In addition, patients' cultural background will be examined to determine whether their experiences have any relation to their own culture or religious convictions.

The most novel aspect is that following the pilot study in Southampton, we will also be testing the claims of cardiac-arrest survivors to be able to "see" and "hear" things during cardiac arrest by placing a number of boards in certain areas within the hospital where patients are more likely to have cardiac arrests. The aim is to place images on both sides of the boards to test claims by some survivors of being able to watch resuscitation efforts. Should someone open their eyes during the cardiac arrest, they will see an image on the underside, whereas if they claim to be at the ceiling, we will also test their claims by putting a different type of image on the side facing the ceiling. This way, if no one sees an image, then we will know that the experiences are likely to be "false memories." If a person sees the image on the side that is facing down and hence visible by opening their eyes, we will know that this was the mechanism, and if somehow they recall seeing the images that are only visible from the ceiling, we will be left with a very interesting scientific conundrum.

In order to measure brain function during cardiac arrest, we have also been doing trials on the use of portable brain monitors to measure brain activity precisely. We will then relate this to the reports of consciousness during cardiac arrest to determine whether consciousness really can exist during a brain "flatline" state.

Depending on what this study shows, further experiments may involve recording the whole cardiac arrest and timing all the events accurately, and instead of having fixed boards with fixed images we could use an electronic random-image generator placed in the rooms so that there is no way that anyone will know what the images will be at any given time.

Like any study, success will of course depend on many factors, including adequate funding and collaboration as well as refinement of the scientific

method. However, the major point is that the technology exists to indirectly test the nature of human consciousness and what happens to it at the end of life.

Should everything go as planned, the results of this study should be available in the not-too-distant future. Moreover, it will be possible for other researchers to carry out similar research independently and confirm any findings in the coming years. In the meantime, we are actively looking for collaborators in academic centers worldwide to work on various aspects relating to research in the area of what happens at the end of life.

❑❑❑❑❑❑

CHAPTER NINE

IMPLICATIONS FOR THE FUTURE

Since writing the first edition of this book, I have embarked on a new adventure in my life. A new page has been turned, and I have left the beloved country in which I grew up to go to another. I have left behind close family and friends and many special memories and have taken up a new post in pulmonary and criticalcare medicine at Cornell University's Presbyterian Hospital in New York. Here I will continue to work in clinical medicine as well as conduct research into the molecular mechanisms of cell and gene function.

The hospital is at the forefront of developments in gene therapy, and I am sure that I will explore the secrets that lie in human genes in great depth, searching not only for new medical treatments but also for the answers to the mysteries of human consciousness. While here, I will also continue with my research into what happens at the end of life.

Isn't it strange that my story commenced with a visit to another famous New York hospital ten years earlier? Now I can look back and say that the questions that Desmond raised in my mind all those years ago have led to real medical progress. So, as I look back, I think to myself, *Well, what have we learned so far?*

We have confirmed that at the very least, the dying process is a pleasant experience for the majority. And although there had been many reports of NDEs in the past, the move by researchers, including our team at Southampton, Dr. Van Lommel, Dr. Schwaninger, and Professor Greyson, to study these experiences "prospectively" at the objective point of death proved to be a major advance over previous "retrospective" approaches. Interestingly, these studies have shown that a proportion of people report

having lucid, wellstructured thought processes with reasoning and memory formation at a time when there should be none. This has raised many intriguing questions regarding the relationship between the mind and the brain.

In an editorial in the prestigious medical journal *The Lancet,* Professor French, a psychologist at the University of London, concluded: "The nature of mind–brain relationships and the possibility of life-after-death are some of the most profound issues relating to mankind's place in the universe. The report … of near-death experiences in survivors of a cardiac arrest provides intriguing data that are relevant to these issues."

Could we now be on the verge of discovering the nature of human consciousness? Scientific mysteries do indeed take many centuries to solve, but could this be the first clue to the puzzle? I believe it is. For centuries the nature of consciousness has been considered a purely philosophical issue, yet now it has become one of the biggest challenges facing neuroscience. Once an "unconventional" area of scientific study, it has now been debated in some of the most highly respected scientific circles.

What is without doubt is that this question is important to us all. Consciousness encompasses every moment of our lives and all our interactions with others. It allows us to know joy or sorrow, happiness or sadness, to feel a sense of shame or pride, to experience a moment of remorse. It gives us higher faculties such as forgiveness, love, compassion, and a moral conscience. It is what allows us to sacrifice our comfort and happiness, or even life, for the love of another. Simply think of our relationships with our loved ones. We interact with each other through our minds, thoughts, and feelings. This is also true on a larger scale when we look at the way in which we conduct ourselves in society. The problem facing science today is where does our consciousness—our free will, conscience, feelings, thoughts, and emotions—actually come from and how is it produced?

Steps Toward Solving the Mystery of Consciousness

Without a doubt, the brain plays a pivotal and essential role in consciousness. We know this because if there is damage to a certain part of

the brain following, for example, a stroke or a head injury, very specific mental functions may be lost, such as memory, the ability to recognize others, or the ability to form sentences. We know this doesn't happen with any other organ in the body, so we can definitely conclude that it is the brain that is involved.

This has been confirmed in recent years with the advent of brain-scanning techniques such as functional MRI and PET that have helped to map out the areas of the brain involved in these functions. We have found a direct correlation between the mind, consciousness, and the brain, but it is only a correlation, and not proof of how the mind comes to exist. As with any correlation, we have to ask the question, does A lead to B, or does B lead to A? We know that there is brain-cell activity in relation to the mind, but which way is the relationship? Is it the brain cells that activate the mind, or is it the mind that activates the brain cells, or could it even be both? Which comes first, the chicken or the egg, the brain or the mind? If we want to be purely scientific, we must keep an open mind and not let our own personal biases cloud our judgment. We should let the evidence guide us.

The majority of scientists currently support the view that brain processes somehow lead to the formation of consciousness. As outlined earlier, many different intermediary brain centers and pathways have been proposed to account for this. There are, however, other scientists, including the Nobel Prize–winning neuroscientist Professor Eccles, who have supported the theory that the mind is a separate entity that cannot be reduced down to brain-cell processes. Some have argued that we will never be able to account for the formation of consciousness through the electrical and chemical processes of the brain. So which of the scientific views is correct?

Until fairly recently, I used to believe that brain processes led to the formation of consciousness and the mind, although, like all the other scientists, I didn't know how. However, studying neardeath experiences in cardiac-arrest survivors has made me question my views, as has the lack of plausible biological mechanisms to account for the causation of consciousness from brain processes. I have now decided to keep a completely open mind and let the evidence sway my opinion. After all, as already mentioned, this wouldn't be the first time in science that a prevailing view has been proven wrong. Personally, I have had to accept that the formation of consciousness is far from clear.

So how do the reports of NDE in cardiac arrest help the research into consciousness? Numerous studies have shown that thought processes are mediated by multiple areas of the brain and not just a single area. For this, brain cells need to communicate, using electrical pulses. During cardiac arrest, there is a severe insult to the brain that causes either no blood flow to the brain or at best severely reduced blood flow. Either way, there is such a deficiency in blood flow that electrical activity in the brain ceases within a few seconds, and there remains a flatline throughout the period of the cardiac arrest and even afterwards for some people. Nevertheless, consciousness appears to be present in 10 to 20 percent of those who are in cardiac arrest.

In normal medical practice, it is well recognized that any alteration in the function of the brain leads to a clouded sense of consciousness, which is highlighted by a confusional state; and if the impairment is more significant, consciousness is lost. All we have to do is spend an evening in an emergency room and we will see that people who have any significant alteration in the level of nutrients and/or chemicals around the brain become confused. This can take place with any illness, whether pneumonia, a heart attack, diabetes, or an infection around the brain. This is the basis of all mental tests on patients who have become acutely unwell. If such conditions are left untreated, they can lead to a coma. However, in all these conditions, the insult is still not so great as to cause the brainwaves to go flat. At worst, they start to show changes in shape. How is it then that we have a clinical scenario in which there is severe brain dysfunction, the worst possible type, with an absence of electrical activity in the brain, but somehow thought processes, with reasoning, memory formation, and consciousness continue and are even heightened?

It may be suggested that the thoughts are arising from a small area of the brain that is somehow able to receive blood flow; however, numerous studies have demonstrated that thought processes are generated by global brain function. Also it is almost impossible for one area to receive blood when there is hardly any blood flow to the brain. Scientifically speaking, there should be no consciousness present at all. How then can we account for the findings of NDE research? As Dr. Van Lommel stated, “How could a clear consciousness outside one’s body be experienced at the moment that the brain no longer functions during a period of clinical death with flat EEG?”

The most obvious explanation seems to be that perhaps the experience isn’t

occurring during the period of cardiac arrest, after all. Dr. Susan Blackmore and Professor Christopher French, two British psychologists, have suggested that it may be occurring just before the crisis, or even just after, when the individual is still in an unconscious state, but blood flow is relatively normal and brain waves are present. Obviously, as the heart stops, there will be a period of a few seconds before blood flow is stopped to the brain; and after the heart recovers, there will be a period in which there is relatively normal blood flow to the brain before the person actually awakens. As memories and thoughts can take place in an instant, Blackmore and French have proposed that NDEs may also be occurring just before or after the event, but the individuals concerned *think* they happened during the main part of the cardiac arrest itself.

This is possible; however, there have been many individuals who have recalled details from the middle of the cardiac arrest, when brain blood flow has been shown to be severely impaired. Think of the examples that were given to me by Drs. Mansfield and La Rovere and Professor Chamberlain. In cases such as these, we can't say that the experience was happening at the beginning or end of the cardiac arrest, as the patients recalled details of what was happening during the cardiac arrest.

This is therefore an area that needs to be investigated in more detail. We need to be able to time the experiences accurately. Dr. Blackmore and Professor French agree that if clear consciousness were possible with a completely flat EEG, this would indeed change our view of the mind–brain relationship, but so far this has not been conclusively demonstrated.

From a scientific point of view, studying the human mind at the physiological point of death, when global blood flow and hence brain function have become severely impaired, is currently the best and possibly the only method of studying the relationship between the mind and the brain. Should consciousness truly be present during this time, then this raises a very interesting point. If mind and consciousness are products of brain activity, then they would be expected to also cease functioning at this time, or at best, very shortly afterward. It is a little like going into a room in which there is a light and not knowing where it's coming from. If we turn the switch off at the wall and the light goes off, then we can conclude that it was coming from the bulb that we turned off. If, on the other hand, we turn the switch off and the light is still present, then we have to conclude that it is coming from another

source.

So far we do not have definitive proof for either theory. However, as many thousands of people, including small children, have reported a fully functioning mind and consciousness and have been able to relate specific events that happened during their cardiac arrest, the possibility is raised that mind and consciousness can exist separately from the brain and also during and at least for some time after death. There are also many anecdotal reports from medical professionals who have resuscitated patients who have told them the details of what happened during their cardiac arrest.

The problem is that so far there have been no studies with ade- quate numbers of patients to investigate this phenomenon fully. When we look for a significant effect with a new drug, we sometimes have to study thousands of subjects, and the same is true with consciousness at the end of life. So it is up to us as scientists to investigate these claims adequately and with appropriate studies, which are now possible. It is also for funding bodies to support such novel research, which could have profound implications for us all. If we take up this challenge, then we can potentially answer the last completely unsolved mystery in biological sciences.

What then of the various brain-based theories to account for NDEs and consciousness? There is no doubt that the body affects the mind and consciousness, and also that the mind and consciousness affect the brain and body. The most important point, as I have come to realize, is that identifying the brain-based chemical changes that accompany any subjective feeling or activity of consciousness will not be likely to tell us if an experience is real or not. It will simply give us the intermediaries that are needed to manifest a subjective event or feeling. This, of course, also applies to the study of the neural correlates of near-death experiences. Finding the intermediary pathways and chemicals will not be able to tell us if an experience is real or not.

In light of the evidence from cardiac-arrest survivors and the large amount of anecdotal evidence that has accumulated, we now need to test the nature of consciousness during cardiac arrest, when brain function is at best severely impaired or at worst ceased. This is now medically possible and will at least tell us which of the broad views regarding the relationship between the mind, consciousness, and brain is correct.

As related earlier, we planned to set up such a large trial, but without

adequate funding it could not be done. We wanted to install specially developed electronic devices in hospital areas where cardiac arrests are likely, such as the emergency areas, with a screen facing the ceiling. These devices would be programmed to generate many random images at any one time so that no one would know exactly which images had been shown at any given moment. While I was working at Hammersmith Hospital last year, one of my neurology colleagues, Dr. Barry Seemungle, suggested that if we used more than one image with each device, this would make a positive response even more significant statistically.

"If there were, say, five images and someone identified all five of them, it would be almost impossible statistically for it to happen by chance alone," he said. The devices would also have been connected to a computer and to a camera that could have accurately recorded events as well as the images on the screen at any given time.

In this way, if a large group of cardiac-arrest survivors had been studied and had reported out-of-body experiences, together with the ability to see events from above, we would have expected them to have also identified the images accurately. If they could have done so, then we would have had to reexamine our views about the relationship between the mind and brain. If, on the other hand, a large group of people had all claimed to be out of body but had not been able to identify the images, then we would have had to conclude that they had imagined being at the ceiling. This would have then supported the theory that mind and consciousness are products of the brain, and that out-of-body experiences are simply illusions.

Now we aim to start this study on a small scale and to raise the funds needed to expand it into a very large study in the near future.

Could Mind and Consciousness Be Separate from the Brain?

Now the question that I have often asked myself is, what would we do if it were discovered that the mind and consciousness were separate from the brain? This would obviously have huge implications for us all. How could we account for this, and what effect would it have on our lives?

As science progresses, novel ways of "seeing" and measuring the world around us are developed. At the turn of the 20th century, the use of x-rays began to revolutionize the practice of medicine. For the first time, doctors could see inside the body. Then, as science progressed, other methods were devised, such as ultrasound technology, where sound waves are passed through the body. This is still commonly used to perform scans, particularly of the abdomen, and any mother will recall the ultrasound scan of her unborn baby. In more recent times, magnetic resonance imaging has enabled us to see inside the body to an accuracy of only a few millimeters. Unfortunately, at present there are no devices available that will allow us to see and measure thoughts and consciousness. However, in view of the enormous progress that has taken place in medicine, and particularly in medical physics, I am sure that in time such a device will be developed. Then perhaps we can quite easily discover the nature of consciousness and its relation to the brain, but for now we have to use indirect means to study it. Nevertheless, we do know that mind and consciousness exist and therefore should be amenable to scientific measurement and study. It is just a matter of when and not if.

When we examine the world around us, we see that all beings are made up of billions of molecules combined together. I am an amazing collection of billions of different molecules, which are themselves made up of a combination of different atoms. When I think further down, I know that at the subatomic level and in the quantum world, everything exists in the form of waves. Therefore, at the very lowest level, all that we are is in the form of waves—not just our physical body, but also our consciousness and thoughts.

Accordingly, I have often wondered whether consciousness is itself a very subtle type of matter that is not yet amenable to measurement by our scientific tools. As we have seen, Professor Elahi, a supporter of the view that mind and consciousness are separate from the brain, has actually suggested that consciousness is made of a very subtle type of matter similar to electromagnetic waves. This may be a very good analogy, as an electromagnetic wave is indeed a subtle type of matter that is not perceived by our physical senses, but of course exists and can be "seen" using the correct apparatus, including television and radio. Scientists only discovered electromagnetic waves in the 19th century and made the first use of radio waves over 20 years later. Nevertheless, electromagnetic waves had always existed. It is the same for all discoveries. The science behind all of them has

existed since the beginning of time, it is just that we are only capable of piecing it together very slowly.

To go back to electromagnetic waves for a moment, interestingly from a medical point of view they can interact with cells in the body. Many studies have shown that subtle types of matter such as ultraviolet light can directly activate cells and cause them to alter their responses just as other chemical messaging systems do. This may account for how the subtle "undiscovered" mind/ consciousness may interact with brain cells and lead to the measurable alterations that are seen in those cells and their connections as consciousness develops. It has been noted that as we learn, the connections between the brain cells in specific areas related to that process become more complex.

In effect, the position that we are currently in regarding the mind and brain is similar to that of a small child who is watching a presenter on a television set. If she doesn't understand how a television works, she may believe that the presenter is actually sitting in the set. She can test this theory by pulling a few wires out of the television and, sure enough, there will be a loss of sound or picture, thus confirming that all that is being seen and heard is coming from the television. Yet although it is possible that the presenter, or "mind and consciousness," is coming from the set, it is also possible that the set is simply acting as a receiver and manifesting what are subtle forms of electromagnetic waves. Yes, we need the set to see those waves, but it is just a decoder. The actual presenter is possibly sitting thousands of miles away.

By studying consciousness at the end of life, we can see whether anything remains independent of the brain, in which case the brain is only acting like the television set, or whether everything is extinguished by shutting down the brain, in which case we must conclude that the brain is producing the mind and consciousness.

Throughout the entire history of scientific progress, there have been numerous examples of very significant shifts in the scientific "belief system" in light of the emergence of new evidence. These paradigm shifts have often taken place in a very slow manner and are very often if not always rejected until the evidence has become strong enough to convince most people that it is correct. These "new beliefs" are usually essential scientific concepts that have been completely unknown and therefore not considered until someone has eventually discovered them. It is very likely that a paradigm shift is needed if our quest to discover the nature of human consciousness is to bear

fruit.

The Implications for Ethics, Theology, and Philosophy

As we commence the 21st century, one of the most interesting observable changes in science has been the widening of its boundaries to encompass a number of traditionally philosophical questions. These questions have largely been thrust upon science as a direct result of its own progress. Recent discoveries and the consequent improvements in medical care have revealed a maze of ethical issues that were formerly reserved for philosophical debate. Many now feel that the progress of science, although undoubtedly bringing benefits, has itself begun to threaten the sanctity of human life.

If we were to assume that aspects of consciousness were simply products of brain-cell activity and the environment, what would this do to our social fabric? What would this do to the notion of free will and accountability? What would this do to our judicial services? At the very extreme, it would mean that no one would be held accountable for their actions, as it would be their brain cells and environment that would have "made" them do it. This of course is not the reality of life in society, and we will become fully aware of it if we try to throw a brick through the window of the most reductionist of neuroscientists! In reality, we do have free will and are accountable for our actions.

My view is that ultimately everything, including issues that may be considered theological or philosophical, is amenable to the objective assessment of science. I acknowledge that should it be discovered that mind or consciousness can exist at the end of life and independent of the brain, this would support the theological and philosophical concept of an "afterlife" and would suggest that the age-old concept of the "soul" is the same as what scientists now call "consciousness." In my opinion, the term we use is not relevant, but it is important to study the process scientifically. If consciousness were discovered to be a separate scientific entity similar to electromagnetic waves, then it would amenable to scientific study.

As Professor Elahi has suggested, the study of consciousness or the "soul"

would then be treated as a science with its own axioms, laws, and theorems. This would lead to the objective study by science of what have traditionally been considered religious and philosophical subjects, thus potentially ending many disagreements and leading to a far more tolerant society. In the same way that science has revolutionized our understanding of the external world around us, it could also revolutionize our understanding of the subjective world inside us.

Before the institutionalization of science, which started with pioneering scientists such as Galileo and Newton, anybody could claim to be correct on any issue. All the progress that we've made in discovering both the world around us and the intricate inner world that exists inside us owes its existence to the objective method of study that was started around 500 years ago. I believe that we now need to apply the same objectivity as our forefathers, put aside personal and philosophical bias, and start by conducting the experiments that would potentially allow us to discover the nature of human consciousness.

The Implications for Medical Care

The study of NDE in cardiac arrest may also have significant benefits for the treatment of many illnesses, including depression. Although Dr. Lili Feng's idea of discovering the neural mediators of the transformational effect of NDEs will not be easy to carry out, it may be possible. People who have had an NDE are certainly left with a very positive effect that makes them less materialistic, less afraid of death, and more altruistic; and these effects are undoubtedly mediated by changes in the expression of genes and specific mediator proteins. The discovery of these molecules could allow us to discover novel ways to treat psychological and psychiatric illnesses, and in effect would allow us to instill the positive effects of NDEs in those who have not had them.

After discovering the brain signals that are involved in the positive transformational effects of NDEs, we could design drugs that would stimulate the same areas and produce the same effect in people who have lost hope and become apathetic. There has been enormous progress recently in the study of the behavioral and dynamic changes that take place in the gene profile in

response to different behavioral states. Significant and ever-evolving biochemical technologies now make it possible to study the activities of hundreds of genes at the same time. Since genes are constantly being activated in response to all sorts of stimuli, modern gene chips have allowed large-scale studies of genes and their changes at any given time.

Another benefit will be that once we discover the actual nature of the mind, we may well discover alternative means of treating its illnesses. Current medical treatment is focused largely on chemical treatment; however, this only works to a limited extent. If we discover that there is a separate component that is of a different nature from chemicals, then we may also be able to discover ways to manipulate it directly.

❑❑❑

I would like to end this book with a poignant real-life story about John, an active, slim, middle-aged man whom I met a few years ago. He was a jovial man who had seen much of the world but had recently been diagnosed with an incurable illness. When we first met, there was a sense of anticipation in his eyes. He had come to the hospital with lots of hope for the future. His mood was vibrant, cheery, and upbeat. He was chatty with the staff and used to joke and laugh with them. We expected his treatment to bring about some improvement, but unfortunately as time went by, we all began to realize that his was a very resistant form of disease and that in his case there was going to be no response.

As time passed on, understandably John began to look more and more dejected and downbeat. In his eyes I could see fear of the future. It was as if he was watching his last glimmers of hope fading away along with his life. Even though his family was there every day to comfort and support him, inwardly he was alone.

One evening John was looking particularly down and low. I asked what had happened, and he told me that although he had suspected it for a while, that day he had finally been given the news that there was no cure for him. I have always found situations like this, which are unfortunately quite commonplace, some of the most difficult to deal with. People put their sincere faith in doctors, they trust us with their dearest possession of all, their lives; and when we run out of options, so invariably do they. Without a doubt

medicine has brought me some of the most immensely rewarding moments of my life, yet there have also been times when I have felt helpless, and this was one of them.

I often think to myself, *What would I do if I had reached that point in my life? Where would I go? How would I deal with my thoughts?* I know some people would argue that we all have only a limited amount of time to live, and I too am aware that after birth the only certain thing in life is death. And yet we actually know very little about what we are likely to experience at the end of life.

John was discharged the following day, and I don't know what happened to him, as I moved away from that part of the hospital a few months later. However, his memory stayed with me. I was also left wondering what we as a profession could offer someone if they wanted to know more about what they were likely to experience at the end of life. At the very least, we should have an objective science that tells us what happens to us all when we die.

I think that NDEs hold the key to finally solving this mystery. In studying them further, we will be able to discover the true nature of the relationship between the mind and the brain and answer the wider questions regarding the existence of an afterlife. Then we can live our lives with the knowledge of what fate will bring to us all.

❑❑❑❑❑❑

FURTHER INFORMATION

If you'd like more information or would like to support our research into the dying process, please visit the Horizon Website: **www.horizonresearch.org**.

Here I've also listed a number of useful internet links that relate to the subjects discussed in this book.

The Horizon Research Foundation (www.horizonresearch.org). This is the Website relating to the charitable foundation that we recently set up.

It has general information on NDEs, as well as on mind, brain, and consciousness; and further research. It's designed to be a resource center for those interested in the science of what happens at the end of life.

The International Association for Near Death Studies (www.iands.org). The International Association of Near Death Studies is the first and largest organization on NDEs, and this Website is a very useful resource.

The Resuscitation Council (www.resus.org.uk). The UK Resuscitation Council's Website provides general information on resuscitation issues.

The Nour Foundation (**www.nourfoundation.com** and **www.ostadelahi.com**). This is a very good Website for links to the work of Professor Bahram Elahi. The Nour Foundation also explores the common moral, ethical, and cultural principles underlying various philosophies and schools of thought through a host of multidisciplinary events by experts from such diverse fields as law, medicine, science, music, and the arts. The philosophy of Ostad Elahi can also be accessed specifically at: **www.ostadelahi.com.**

The Center for Consciousness Studies (www.consciousness.arizona.edu). This is the Website for the Center for Consciousness Studies at the University of Arizona and is a very good resource for consciousness studies. There are online courses and also

conference details.

Stuart Hameroff (www.quantumconsciousness.org). This is Stuart Hameroff's Website, where he explains his theories on consciousness being a quantum process. It is a very good site.

Particle Physics (www.particleadventure.com). This award-winning Website explains particle physics to nonspecialists and lay people wonderfully.

❑❑❑❑❑❑

RECOMMENDED READING

Although there follows a very complete Bibliography regarding the main issues in this book, for many people a short recommended reading list may be more helpful. Therefore, the following are selected reading materials from the Bibliography.

Chapter 1: Near-Death Experiences from Antiquity to the Present Day

Blackmore, S. J., "Near-death experiences," *Journal of the Royal Society of Medicine* 89 (1996), 73–6

Fenwick, P., and Fenwick, E., *The Truth in the Light*, Hodder Head-line, 1995

Jansen, K., "Near-death experience and the NMDA receptor," *BMJ* 298 (1989), 1708

Moody, R. A., *Life After Life*, Bantam Press, 1975

Roberts, G., and Owen, J., "The near-death experience," *British Journal of Psychiatry* 153 (Nov. 1988), 607–17

Chapter 4: The Scientific Paradox

Paradis, N. A., Halperin, H. A., and Nowak, R. A., *Cardiac Arrest: The Science and Practice of Resuscitation Medicine*, Williams and Wilkins, 1996

Parnia, S., and Fenwick, P., "Near-death experiences in cardiac arrest: visions of a dying brain or visions of a new science of consciousness,"*Resuscitation* 52 (Jan. 2002), 1, 5–11

Chapter 5: Understanding Mind, Brain, and Consciousness

Blackmore, S., *Consciousness: An Introduction*, Hodder and Stough-ton, 2003

Chalmers, D. J., "The puzzle of conscious experience"; "Mysteries of the Mind," *Scientific American* (special issue), 1997, 30–37

Crick, F., and Koch, C., "The problem of consciousness"; "Mysteries of the Mind," *Scientific American* (special issue), 1997

Eccles, J. C., and Popper, K., *The Self and Its Brain*, Routledge, 2003

Editorial, "Mysteries of the Mind," *Scientific American* (special issue), 1997

Elahi, B., *Foundations of Natural Spirituality: A Scientific Approach to the Nature of the Spiritual Self,* Element Books, 1998

——, *Spirituality Is a Science,* Cornwall Books, 1999

——, *Medicine of the Soul,* Cornwall Books, 2001

Penrose, R., *Shadows of the Mind,* Oxford University Press, 1994

Chapter 6: The Ingredients of Life

Gribbin, J., *Almost Everyone's Guide to Science,* Yale University Press, 2000

Chapter 7: Is It Real?

Henslin, J., *Down to Earth Sociology: Introductory Readings,* 13th edi-tion, Free Press, 2005

Newberg, A., *Why God Won't Go Away: Brain Science and the Biology of Belief,* Ballantine Books, 2002

BIBLIOGRAPHY

Chapter 1: Near-Death Experiences from Antiquity to the Present Day

Appleton, R. E., “Reflex anoxic seizures,” *British Medical Journal* 307 (1993), 214–15

Blackmore, S. J., “Near-death experiences,” *Journal of the Royal Society of Medicine* 89 (1996), 73–6

Blackmore, S. J., and Troscianko, T., “The physiology of the tunnel,” *Journal for Near Death Studies* 8 (1988), 15–28

Carr, D., “Pathophysiology of stress-induced limbic lobe dysfunction: a hypothesis for NDEs,” J. *Near Death Studies* 2 (1982), 75–89

Carr, D. B., “Endorphins at the approach of death,” *Lancet* (1981), 1/8216, 390

Feng, Z., “A research on near-death experiences of survivors in big earthquake of Tangshan, 1976,” *Chung Hua Shen Ching Ching Shen KO Tsa Chih* 25 (Aug. 1992), 222–5, 253–4

Fenwick, P., and Fenwick, E., *The Truth in the Light*, Hodder Headline, 1995

Gallup, G., *Adventures in Immortality: A Look Beyond the Threshold of Death*, McGraw-Hill, 1982

Greyson, B., “Near-death experiences and attempted suicide,” *Suicide Life Threatening Behaviour* 11 (Spring 1981), 1, 10–16

——, “Near-death experiences and personal values,” *American Journal of Psychiatry* 140 (May 1983), 5, 618–20

——, “The near-death experience scale construction, reliability, and validity,” *Journal of Nervous Mental Disease* 171 (1983), 369–75

——, “Incidence of NDEs following attempted suicide,” *Suicide Life Threat.* Behav. 16 (Spring 1986), 1, 40–5

——, “The near-death experience as a focus of clinical attention,” *J. Nerv. Ment. Dis.* 185 (May 1997), 5, 327–34

——, “Dissociation in people who have near-death experiences: out of their bodies or out of their minds?,” *Lancet* 355, 5 February 2000, 9202, 460–3

Heim, A., “Notizen über den Tod durch Abstutz,” Jahrbuch des schweizer. *Alpenclub* 27 (1892), 327–37

Herzog, D. B., and Herrin, J. T., “Near-death experiences in the very young,” *Critical Care Medicine* 13 (Dec. 1985), 12, 1074–5

Jansen, K., “Near-death experience and the NMDA receptor,” *BMJ* 298 (1989), 1708

Kellehear, A., “Culture, biology, and the near-death experience,” *J. Nerv. Ment. Dis.* 181 (1993), 148–56

Kelly, E. W., “Near-death experiences with reports of meeting deceased people,” *Death Stud*. 25 (Apr.–May 2001), 3, 229–49

Lempert, T., “Syncope and near-death experience,” *Lancet* 344 (1994), 829–30

Meduna, L., Carbon Dioxide Therapy: a Neurophysiological Treatment of Nervous Disorders, 2nd edition, Charles C. Thomas Publisher, 1958

Moody, R. A., *Life after Life,* Bantam Press, 1975

Morse, M. L., “Near-death experiences of children,” *J. Ped. Onc. Nursing* 11 (1994), 139–44

Morse, M., Castillo, P., Venecia, D., Milstein, J., and Tyler, D. C., “Childhood near-death experiences,” *Am. J. Dis. Child* 140 (1986), 1110–14

Morse, M., Venecia, D., and Milstein, J., “Near-death experiences: A neuro-physiologic explanatory model,” J. *Near Death Studies* 8 (1989), 1, 45–53

Noyes, R., and Kletti, R., “Depersonalisation in the face of life threatening danger: a description,” *Psychiatry* 39 (1976), 251–9

Osis, K., and Haraldsson, E., *At the Hour of Death,* Avon Books, 1977

Owens, J. E., Cook, E. W., and Stevenson, I., “Features of “near-death experience” in relation to whether or not patients were near death,” *Lancet* 336 (1990), 1175–7

Pascricha, S., and Stevenson, I., “Near-death experiences in India,” *J. Nerv. Ment. Dis*. 55 (Oct. 1986), 4, 542–9

Plato, *The Republic,* J. M. Dent & Sons, 1937

Ring, K., *Life at Death: a Scientific Investigation of the Near-death Experience,* Coward McCann and Geoghenan, 1980

Roberts, G., and Owen, J., “The near-death experience,” *Br. J. Psychiatry* 153 (Nov. 1988), 607–17

Serdahely, W. J., “Pediatric near-death experiences,” *Journal of Near Death Studies* 9 (1990), 1

Sotelo, J., Perez, R., Guevara, P., and Fernandez, A., “Changes in brain, plasma and cerebrospinal fluid contents of B-endorphin in dogs at the moment of death,” *Neurological Research* 17 (June 1995), 223

Whinnery, J. E., and Whinnery, A. M., “Acceleration-induced loss of consciousness,” *Arch. Neurol*. 47 (1990), 764–76

Chapter 4: The Scientific Paradox

Near-death experiences in cardiac arrest: Greyson, B., “Incidence and correlates of near-death experiences in a cardiac care unit,” *General Hospital Psychiatry* 25 (July–Aug. 2003), 4, 269–76

Martens, P. R., “Near-death-experiences in out-of-hospital cardiac arrest survivors: meaningful phenomena or just fantasy of death?,” *Resuscitation* 27 (Mar. 1994), 2, 171–5

Parnia, S., Waller, D., Yeates, R., and Fenwick, P., “A qualitative and quantitative study of the incidence, features and aetiology of near-death experiences in cardiac arrest survivors,” *Resuscitation* 48 (Feb. 2001), 149–56

Parnia, S., and Fenwick, P., “Near-death experiences in cardiac arrest: visions of a dying brain or visions of a new science of consciousness?,” *Resuscitation* 52 (Jan. 2002) 1, 5–11

Ring, K., *Life at Death: a Scientific Investigation of the Near-Death Experience,* Coward McCann and Geoghenan, 1980

Schwaninger, J., “A prospective analysis of near-death experiences in cardiac arrest patients,” *Journal of Near-death experiences* 20 (2002), 4

Van Lommel, P., Van Wees, R., Meyers, V., and Elfferich, I., “Neardeath experience in survivors of cardiac arrest: a prospective study in the Netherlands,” *Lancet*, 358, 15 Dec. 2001, (9298), 2039–45

Brain blood flow and physiology during cardiac arrest:

Angelos, M., Safar, P., Reich, H., “A comparison of cardiopulmonary resuscitation with cardiopulmonary bypass after prolonged cardiac arrest in dogs: reperfusion pressures and neurologic recovery,” *Resuscitation* 21 (1991), 121–35

Buunk, G., Van der Hoeven, J. G., and Meinders, A. E., “Cerebral blood flow after cardiac arrest,” *The Netherlands Journal of Medicine* 57 (2000), 106–12

Cartlidge, N., “Head injury, outcome and prognosis” in M. Swash and J. Oxbury (eds), *Clinical Neurology*, vol. I, Churchill Livingstone, 1991

Cerchiari, E. L., Hoel, T. M., Safar, P., and Sclabassi, R. J., “Protective effects of combined superoxide dismutase and deferoxamine on recovery of cerebral blood flow and function after cardiac arrest in dogs,” *Stroke* 18 (1987), 869–78

Clute, H. L., and Levy, W. J., “Electroencephalographic changes during brief cardiac arrest in humans,” *Anesthesiology* 73 (1990), 821–5

De Vries, J. et al., “Changes in cerebral oxygen uptake and cerebral electrical activity during defibrillation threshold testing,” *Anesth. Analg*. 87 (1998), 16–20

Drejer, J., Benveniste, H., Diemer, N. Y. et al., “Cellular origin of ischemic-induced glutamate release from brain tissue in vivo and in vitro,” *J. Neurochem* 45 (1985), 145–50

Fischer, M., and Hossman, K. A., “Volume expansion during cardiopulmonary resuscitation reduces cerebral no-reflow,” *Resuscitation* 32 (1996), 227–40

Gonzalez, E. R., Ornato, J. P., and Garnett, A. R., “Dose dependent vasopressor response to epinephrine during CPR in human beings,” *Ann.Emerg. Med*. 18 (1991), 920–6

Kano, T., Hashiguchi, A., and Sadanaga, M., “Cardiopulmonarycerebral resuscitation by using cardiopulmonary bypass through the femoral vein and artery in dogs,” *Resuscitation* 25 (1993), 265–81

Krause, G. S., White, B. C., Aust, S. D., Nayini, N. R., and Kumar, K., “Brain cell death following ischemia and reperfusion: a proposed biochemical sequence,” *Crit. Care Med*. 16 (1988), 714–26

Lavy, S., and Stern, S., “Electroencephalographic changes following sudden cessation of artificial pacing in patients with heart block,” *Confin. Neurol.* 29 (1967) (Basel), 47

Lishman, W. A., “Head Injury” in Organic Psychiatry, 2nd edition, *Blackwells*, 1987

Longstaff, A., *Instant Notes in Neuroscience*, BIOS Scientific Publishers, 2000

Marshall, R. S., Lazar, R. M., and Spellman, J. P., “Recovery of brain function during induced cerebral hypoperfusion” *Brain* 124 (2001), 1208–17

Mayer, J., and Marx, T., “The Pathogenesis of EEG Changes during Cerebral Anoxia” in J. Van Der Drift (ed.), *Cardiac and Vascular Diseases Handbook of Electro-encephalography and Clinicial Neurophysiology*, Amsterdam, 1972

Paradis, N. A., Martin, G. B., and Goetting, M. G., “Simultaneous aortic jugular bulb, and right atrial pressures during cardiopulmonary resuscitation in humans: insights into mechanisms,” *Circulation* 80 (1989), 361–8

Paradis, N. A., Martin, G. B., and Rosenberg, J., "The effect of standard and high dose epinephrine on coronary perfusion pressure during prolonged cardiopulmonary resuscitation," *Journal of the American Medical Association* 265 (1991), 1139–44

Paradis, N. A., Halperin, H. A., and Nowak, R. A., *Cardiac Arrest: The Science and Practice of Resuscitation Medicine,* Williams and Wilkins, 1996

Teasdale, G., "Head Injury: Concussion, coma and recovery from altered states of consciousness" in M. Swash and J. Oxbury (eds), *Clinical Neurology,* Churchill Livingstone, 1991

Traynelis, S. F., and Cull-Candy, S. G., "Proton inhibition of Nmethyl-D-Aspartate receptors in cerebellar neurons," *Nature* 345 (1990), 347–50

Chapter 5: Understanding Mind, Brain, and Consciousness

Beck, F., and Eccles, J. C., "Quantum aspects of brain activity and the role of consciousness," *Proceedings of the National Academy of Science USA* 89 (1 Dec. 1992), 23, 11357–61

Blackmore, S., *Consciousness: An Introduction,* Hodder and Stoughton, 2003

Britton, W. B., and Bootzin, R. R., "Near-death experiences and the temporal lobe,"*Psychol Sci.* 15 (Apr. 2004), 4, 254–8

Chalmers, D. J., "The puzzle of conscious experience," "Mysteries of the Mind," *Scientific American* (special issue), 1997, 30–37

——, *the Conscious Mind: in Search of a Fundamental Theory,* Oxford University Press, 1997

Crick, F., and Koch, C., "Consciousness and neuroscience," *Cerebral Cortex* 8 (Mar. 1998), 2, 97–107

Dennett, D., "Are we explaining consciousness yet?," *Cognition* 79 (Apr. 2001), 1–2, 221–37

——, *Consciousness Explained,* Back Bay Books, 1992

"Does neuroscience threaten human values?" *Nature Neuroscience,* Nov. 1998, 1, 535–6

Eccles, J. C., Evolution of consciousness," *Proc. Natl. Acad. Sci.* USA 89 (15 Aug. 1992), 16, 7320–4

——, *Evolution of the Brain: Creation of the Self,* Routledge, 2001

Eccles, J. C., and Popper, K., *The Self and Its Brain,* Routledge 2003

Editorial, "Mysteries of the Mind," *Scientific American* (special issue), 1997

Elahi, B., *Foundations of Natural Spirituality: A Scientific Approach to the Nature of the Spiritual Self,* Element Books, 1998

——, *Spirituality Is a Science,* Cornwall Books, 1999

——, *Medicine of the Soul,* Cornwall Books, 2001

Fenwick, P., "Current Methods of Investigation in Neuroscience" in M. Velmans (ed.), *Investigating Phenomenal Consciousness,* John Benjamins Publishing Company, 2000

Flohr, H., "An information processing theory of anesthesia," *Neuropsychologia* 33 (Sept. 1995), 9, 1169–80

Flohr, H., Glade, U., and Motzko, D., "The role of the NMDA synapse in general anesthesia," *Toxicol. Lett.,* 23 Nov. 1998, 100–101, 23–9

Frackowiak, R., Friston, K., Frith, C., Dolan, R., and Mazziotta, J. C., *Human Brain Function,*

Academic Press, 1997

Freeman, W., “Consciousness, intentionality and causality,” *Journal of Consciousness Studies* 6 (1999), 11–12, 143–72

French, C. C., “Dying to know the truth: visions of a dying brain, or false memories?,” *Lancet* 358, 15 December 2001, 9298, 2010–1

Greenfield, S, “Mind, brain and consciousness,” *British Journal of Psychiatry* 181 (Aug. 2002), 91–3

Hameroff, S., Nip, A., Porter, M., and Tuszynski, J., “Conduction pathways in microtubules, biological quantum computation, and consciousness,” *Biosystems* 64 (Jan. 2002), 1–3, 149–68

Huettel, S. A., Song, A. W., and McCarthy, G., *Functional Magnetic Resonance Imaging,* book and CD-Rom edition, Sinauer Associates, 2004

Kandel, E. R., Schwartz, J. H., and Jessell, T., *Principles of Neural Science,* McGraw-Hill, 2000

Penrose, R., *Shadows of the Mind,* Oxford University Press, 1994

——, “Consciousness, the brain, and spacetime geometry: an addendum. Some new developments on the Orch OR model for consciousness,” *Ann. NY Acad. Sci*. 929, (Apr. 2001), 105–10

Ramachandran, R., *A Brief Tour of Human Consciousness: From Impostor Poodles to Purple Numbers,* Pi Press, 2004

Rees, G., Kreiman, G., and Koch, C., “Neural correlates of consciousness in humans,” *Nat. Rev. Neurosci.* 3 (Apr. 2002), 4, 261–70

Searle, J., “The mystery of consciousness,” *New York Review of Books,* 1997

——, “Do we understand consciousness?,” *Journal of Consciousness Studies* 5 (1998), 5–6, 718–33

Tononi, G., and Edelman, G. M., “Consciousness and complexity,” *Science* 282 (4 Dec. 1998), 5395, 1846–51

Valk, P. E., Bailey, D. L., Townsend, D. W., and Maisey, M. N., *Positron Emission Tomography: Basic Science and Clinical Practice,* Springer, 2003

Chapter 6: The Ingredients of Life

Asimov, I., and Bach, D. F., *Atom: Journey across the Subatomic Cosmos,* Plume Books, 1992

Gribbin, J., *Almost Everyone’s Guide to Science,* Yale University Press, 2000

Griffiths, D., *Introduction to Elementary Particles,* John Wiley & Sons, 1987

Kuhn, K. F., *Basic Physics: A Self-teaching Guide,* 2nd edition, John Wiley & Sons, 1996

Martin, B. R., and Shaw, G., *Particle Physics,* 2nd edition, John Wiley & Sons, 1997

Chapter 7: Is It Real?

Blanke, O., “Out of body experiences and their neural basis,” *BMJ* 329, 18 December 2004, 7480, 1414–15

Blanke, O., Ortigue, S., Landis, T., and Seeck, M., “Stimulating illusory own-body perceptions,” *Nature* 419, 19 September 2002, 6904, 269–70

Blanke, O., and Arzy, S., “The out-of-body experience: disturbed self-processing at the temporo-parietal junction,” *Neuroscientist* 11 (Feb. 2005), 1, 16–24

Henslin, J., *Down to Earth Sociology: Introductory Readings*, 13th edition, Free Press, 2005

Newberg, A., *Why God Won't Go Away: Brain Science and the Biology of Belief*, Ballantine Books, 2002

Newberg, A. B., and Iversen, J., "The neural basis of the complex mental task of meditation: neurotransmitter and neurochemical considerations," *Medical Hypotheses* 61 (Aug. 2003), 2, 282–91

Newberg, A., Pourdehnad, M., Alavi, A., and d'Aquili, E. G., "Cerebral blood flow during meditative prayer: preliminary findings and methodological issues," *Percept. Mot. Skills* 97 (Oct. 2003), 2, 625–30

Penfield, W., *The Excitable Cortex in Conscious Man*, Liverpool University Press, 1958

Chapter 9: Implications for the Future

The references quoted in this chapter have all been included in Chapters 4–7.

ABOUT THE AUTHOR

Sam Parnia, M.D., Ph.D., is the U.K.'s leading expert on neardeath experiences. He now spends his time between U.K. hospitals and Cornell University in New York, where he's a Fellow in pulmonary and critical-care medicine. He founded the Consciousness Research Group and is chairman of the Horizon Research Foundation. Dr. Parnia is constantly in demand as a speaker, and he's made numerous media appearances. His groundbreaking research was recently featured in the BBC 2 and Discovery documentary, *The Day I Died.*

❑❑❑❑❑❑